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Agricultural Production and Industrial Capital Formation, India, 1951-52 to 1964-65

UJAGAR S. BAWA

NEW YORK STATE COLLEGE OF AGRICULTURE
A STATUTORY COLLEGE OF THE STATE UNIVERSITY
AT CORNELL UNIVERSITY, ITHACA, NEW YORK

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March 1971

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Preface

It is logical to expect that agriculture as the dominant sector in low-income economies would have a major influence on the pace and pattern of capital formation. Since agriculture generates a high proportion of total national income in such economies, one would expect that changes in agricultural production — whether induced by new investment, technological change, or fluctuations in weather — would substantially influence the total national income. This, in turn, would be expected to affect savings and investment rates. Agriculture should have more direct influences on the level of capital formation both within agriculture and in other sectors. Changes in technology and supply-demand balances should influence the profitability of investment in agriculture and the size of the income pool from which savings and investments are made. In the non-agricultural sector, cost structures are influenced by the prices of industrial raw-material crops produced in agriculture and by the price of basic food commodities which comprise a major portion of consumption expenditures of the industrial labor force.

Unfortunately, we know relatively little of the historical relationship between changes in agricultural production and savings and investment in various sectors of the economy. We know even less about the processes by which changes in the agricultural sector may be translated into influences on other sectors of the economy.

Ujagar Bawa has examined these questions for the Indian economy during the first 3 Five Year Plans. He presents here data concerning changes in agricultural production, with particular emphasis on the major fluctuations arising from changes in weather and in quantity and composition of savings and investment rates for various groups within the economy. He has studied the structure of the industrial sector of the economy with particular attention to the importance of agricultural raw materials and food on industrial costs. He recognizes the importance of the service sector and particularly the government, since the government sector is influenced by changes in the agricultural sector and passes on that influence to other sectors. Mr. Bawa had constructed models dealing with relationships between agriculture and other sectors with respect to savings and investment and has traced the broad empirical relationship between agricultural production and savings and investments. He emphasizes the key role of industrial raw-material crops in influencing industrial costs, incentives to invest, and investment rates.

Mr. Bawa brings to this study substantial experience in dealing with data from the Indian economy. Of most relevance in this respect was his

period with the Input-Output Section of the Planning Commission, Government of India.

This study of the relationship between agriculture and other sectors in capital formation in the Indian economy is one of a series being conducted at Cornell University as part of a USAID-financed contract for research on agricultural prices. We are grateful for the assistance provided by the Agricultural and Rural Development Service of the War on Hunger of USAID and, in particular, to Douglas Caton, Norman Ward, and Voyce Mack.

The broad program of study, of which this is a part, covers 3 major areas of enquiry: (1) the role of prices in intersectoral income and capital transfers; (2) the effect of price relationships on agricultural production and marketings; and (3) the factors affecting urban prices of agricultural commodities. Thus, in total these studies are concerned with the effects of agricultural prices on the nonagricultural sectors of the economy, with their effects in the agricultural sector, and with the manner in which agricultural prices are determined. Over the course of the contract, a substantial number of studies are under way in various countries, dealing with various aspects of the processes. At the completion of these studies an effort will be made to combine them into an integrated view of the role and functioning of agricultural prices in the development process.

A basic objective of the contract with USAID is to provide, in addition to useful research results, a structured research experience so as to enlarge the pool of trained manpower for the analysis of such problems. For this purpose, the research in this project is accomplished primarily by Ph.D. candidates at Cornell University who report their studies in the form of doctoral dissertations. The definition of the overall project has purposely been kept broad and flexible to facilitate the attainment of this additional objective. This report by Ujagar Bawa is part of that program and is based on his Ph.D. thesis entitled *The Relationships between Agricultural Production and Industrial Capital Formation in India, 1951–52 to 1964–65*, which was completed at Cornell University in 1968.

John W. Mellor

Ithaca, New York
October, 1969.

Chapter I. Introduction

This study investigates the relationship between agricultural production and industrial capital formation in India in the period 1951–52 to 1964–65.

Capital formation in the industrial sector of a developing economy is essential to economic growth because underdeveloped areas are underequipped with capital in relation to their population and natural resources. Furthermore, replacement of a backward technology in the industrial sector invariably involves expansion in the total capital stock. Capital formation requires that a society divert part of its current productive activity for immediate consumption and direct a part to the making of real capital goods

The agricultural sector plays a key role in contemporary theories of industrial growth and capital formation.[1] Most of the theories center around a wage-goods argument. In this conception, the supplying of subsistence food for a growing urban labor force engaged in producing capital goods is an important form of capital contribution from the agricultural sector. Industrial development accelerates the growth rate of agriculture by increasing the demand for wage goods, of which food is a major portion. But 2 important aspects of the relationship between agriculture and industrial capital formation are overlooked by these authors. First, they neglect the contribution of agriculture in providing raw materials to the growing industrial sector. agriculturally produced industrial raw materials comprise a larger fraction of the total industrial costs than do wages and salaries Secondly, they view only 2 broad sectors of the economy — agriculture and industry — and do not take into account the role of government and the service sectors in the development process. Wages and salaries are relatively more important in the cost structure of the service sectors than in the industrial sector.

My study analyzes the statistical relationship between agricultural pro-

[1]Fei, J. C. H. and Ranis, G. Development of labor surplus economy. R. D. Irwin, Homewood, Ill. 1964

Jorgenson Dale W. The development of a dual economy. Econ. J. 71. June 1961.

Lewis, W. Arthur. Economic development with unlimited supplies of labor. Manchester School. May 1964.

Mellor, J. W. Towards a theory of agricultural development. *In* Agriculture and economic development, ed. by Bruce F. Johnston and Herman Southworth. Cornell Univ. Press, Ithaca, N.Y 1967.

Nicholls, W. H. The place of agriculture in economic development. Pap. presented Round Table Conf. Econ. Develop. partic. ref. East Asia. Gomagori, Jap. Apr. 1960.

duction and industrial capital formation for the period 1951–52 to 1964–65. Although it would improve the analysis to deal with a longer time period, data for a period earlier than 1951–52 would be too greatly influenced by the effects of World War II, the famine of 1943, and the Partition of 1947. After 1964–65, the worst drought in recorded history caused distortions that prevailed beyond the latest year for which data are available.

Chapter II deals with the structure and sources of capital formation in the industrial sector and analyses of various related aggregate relationships. In Chapter III the various transfer mechanisms are examined from the point of view of taxes, direct investments, and the domestic terms of trade. This is followed by study of the direct influence of agricultural production on industrial investments through its effect on prices of industrial raw materials and wages (Chapter IV). Chapter V includes analysis of the relative importance of various consumption goods for urban and rural areas, agricultural-labor households, and industrial workers. As a related subject, agricultural production and prices as they affect the demand for industrial products are examined. In Chapter VI the indirect effects of agriculture on industrial capital formation by means of government and services sectors are discussed. An econometric model based on a system of simultaneous equations has been developed (Chapter VI) to show the interdependence of agricultural production and industrial capital formation. The conclusions and recommendations are summarized in Chapter VII.

Chapter II. Structure and Sources of Industrial Capital

Study of structure is essential to an understanding of the relative importance of various factors that influence capital formation. Study of the sources of capital shows how capital formation is financed.

Capital formation, for purposes of this study, has been defined in terms of investment in (1) gross fixed assets such as land, buildings, plants, and machinery, and (2) inventories of raw materials, finished goods, and work in progress during an April–March period. This definition, generally, conforms with the definition adopted by the United Nations Statistical Office.[2] *Domestic capital formation* is that part of a country's current output and imports not consumed or exported during the accounting period, but set aside as additions to its stock of capital goods.

[2]Concepts and definitions of capital formation. Statis. Off., United Nations, New York. July 1953.

Net capital formation is distinguished from *gross capital formation* in that it is measured after allowances have been made for depreciation, obsolescence, and accidental damage to fixed capital. Conceptually, net capital formation represents the additions to *fixed capital* (buildings, other constructions and works, equipment, and machinery) and *working capital* (producers' stocks) available for future production. But in terms of data and their availability, a considerable amount of subjectivity goes into the estimates of depreciation and the rate of obsolescence. Because of this and limited availability of data, we have been concerned here with gross, not with net, capital formation.

The structure of industry and of sources of capital differs somewhat between the public and private sectors. The sources of capital formation for the private sector are, broadly: (1) self-financing for small enterprises, and (2) financing for large enterprises by way of self-financing, loans from the government, net imports, and miscellaneous. The sources of funds for the public sector are the revenue account and the capital account, and can be classified as: (1) surpluses from current revenues and public undertakings, (2) surpluses from railways, (3) borrowings from public (net), (4) small savings, (5) other budgeting sources such as the provident fund, (6) treasury bills, and (7) net imports.

Industrial Structure

Estimates of capital structure for large- and medium-scale industries in the private sector were derived from studies of the Reserve Bank of India on joint stock companies. Matching data on small-scale industries were not available, but the small-scale industries sector seems to represent only 10 to 15 percent of the entire industrial sector, as estimated by sample studies of the National Sample Survey.[3] The organized corporate sector is, therefore, taken to represent the behavioral pattern of the private industrial sector. In omitting the small-scale industries sector, however, the direct investments by agriculturists in such forms as brick kilns and sugar mills are undoubtedly underestimated.

For the entire manufacturing sector, which includes both public and private industrial sectors, the structure has been constructed from the input–output accounts for the year 1959–1960.[4] The data used for this purpose were obtained from *Annual Survey of Industries (ASI) 1959*. Factories employing 50 or more workers with the aid of power or 100 or more workers without the aid of power were completely enumerated. The remaining factories, employing 10 to 49 workers with the aid of power or 20 to 99 workers without the aid of power, were covered on the

[3] Government of India, Cabinet Secretariat. Nat. Sample Survey Rept. 43: p. 7. May 1955–May 1956.

[4] Government of India, Planning Commission. Inter-industry table 1959. Unpub. study, 1965, based on Annual survey of industries, 1959.

basis of probability sample. Public, private, and cooperative sector ownership limits of all types were covered.

The structure of the Indian manufacturing sector for 1959–60, as measured by gross value added, is presented in table 1.

The group of industries relating to the agricultural and agriculturally based industries — *processing and manufacture: foodstuffs, textiles, leather, and products thereof* — accounts for one-half of the gross value added of the entire manufacturing complex. This is accountable primarily between food, beverage, and tobacco industries (29 percent) and the textiles (17 percent). Iron and steel and cement comprise only 5 percent and 1 percent of the total gross value added.

The Reserve Bank of India (RBI) has been studying continuously the joint stock companies on a sample basis, gradually increasing the coverage from 750 to 1333 companies. All government companies (as defined in Section 617 of the Companies Act, 1956), banking, insurance and investment companies, companies and associations not functioning for profits, and companies limited by guarantees were excluded. The companies included represented about 79 percent of the entire nonfinancial, nongovernmental, public-limited-company sector in terms of paid-up capital. This sector is called the "private organized sector."

The 1333 companies surveyed are grouped into 28 industries and 6 groups of industries. The industries, along with the major groups, are given in the Annexure to this chapter. The relative importance of each industry within each group and in relation to other industries of other groups has been examined from the standpoint of gross fixed assets, paid-up capital, and value added. Industries that have a direct bearing on agriculture, such as textiles, edible oils, and tea, rubber, and coffee plantations and a sample of those that are completely contrasting to agriculture and known to be conventionally important, such as iron and steel, cement, electrical machinery, etc., are studied. Analysis of the data for the years 1960–61 to 1963–64 shows that the relative importance of various industry groups remained almost constant over this period.[3] In view of this, the structure has been studied in detail only for 1963–64.

The percentage shares for the selected industry groups in respect to paid-up capital, gross fixed assets and gross value added in 1963–64 are given in table 2. The relationships among industries are similar for each of the 3 measures.

In terms of gross value added, the group *processing and manufacture — foodstuffs, textiles, leather, and products thereof* represented the largest share, about 40 percent. The second in importance was the group of industries consisting of *metals, chemicals, and their products*. These 2 groups comprised almost three-fourths of the total value added in this

[3]Bawa, Ujagar S. The relationship between agricultural production and industrial capital formation in India, 1951–52 to 1964–65, Append 3.1–3.3. Thesis for degree of Ph.D., Cornell Univ., Ithaca, N.Y. Microfilmed 1968.

Table 1. **Industrial structure, 1959**

Industry	Gross output	Total inputs*	Gross value added	
	rupees in crores†			percent
Mining and quarrying	163.3	29.5	133.8	(6.8)
Iron ore	6.7	2.4	4.3	(0.2)
Coal	94.9	17.0	77.9	(3.9)
Other mining	61.7	10.1	51.6	(2.5)
Processing and manufactures (foodstuffs, textiles, leather, and products thereof)	2,619.1	1,578.7	1,040.4	(52.5)
Food, beverages, and tobacco	1,451.2	877.4	753.8	(29.0)
Rubber and leather	153.6	81.0	72.6	(3.7)
Jute and coir	161.7	93.8	67.9	(3.3)
Textiles	852.6	526.5	326.1	(16.5)
Processing and manufactures (metals, chemicals, and products thereof)	1,151.4	667.9	483.5	(24.4)
Iron and steel	236.6	142.8	93.8	(4.7)
Aluminum and other nonferrous metals	18.6	12.7	5.9	(0.3)
Electrical equipment	101.8	62.8	39.0	(2.0)
Nonelectrical equipment	318.9	179.4	139.5	(7.0)
Transport equipment	237.9	132.1	105.8	(5.3)
Chemicals	212.0	121.3	90.7	(4.6)
Fertilizers	25.6	16.8	8.8	(0.5)
Processing and manufactures (not elsewhere classified)	363.6	177.5	186.1	(9.4)
Cement	44.4	26.8	17.6	(0.9)
Glass, wood, and nonmetallic industries	188.9	81.4	107.5	(5.4)
Paper and paper products	130.3	69.3	61.0	(3.1)
Other industries	297.3	160.9	136.4	(6.9)
Electricity generation and transmission	124.6	53.4	71.2	(3.6)
Petroleum and petroleum by-products	72.0	47.4	24.6	(1.2)
Other industries	100.7	60.1	40.6	(2.1)
Total	4,594.7	2,614.5	1,980.2	(100.0)

Source: Government of India, Planning Comm., Inter-Indus. Study Group. Unpub. study for 1959, based on ann. surv. indus. 1959.

*Inputs include material resources, transports, trade margins, indirect taxes and noncompetitive imports.

†1 Crore = 10 million.

sector. The subgroup *textiles* formed about 32 percent of the total value added and nearly 80 percent of this particular group of industries. Cotton

Table 3. **Structure of the private organized sector of industry, 1963–64**

	Number of companies	Percentage shares		
		Paid-up capital	Gross fixed assets	Gross value added
Agriculture and allied activities (including tea, coffee, and rubber plantations)	198	3.8	3.0	3.5
Mining and quarrying	60	2.2	2.8	4.1
Processing and manufacture (foodstuffs, textiles, leather and products thereof)	490	30.9	35.4	39.7
cotton textiles	260	15.2	21.1	24.3
jute textiles	56	3.5	4.5	5.3
silk and rayon textiles	10	2.2	2.5	1.6
woolen textiles	7	—	—	0.4
edible oils, etc.	16	—	—	0.6
(Subtotal textiles)	333	21.3	28.3	31.6
Processing and manufactures (metals, chemicals, and products thereof)	291	34.3	33.2	33.1
iron and steel	2	6.5	11.9	7.4
transportation equipment	33	6.3	4.8	5.4
electrical machinery, etc.	45	3.0	1.9	3.7
ferrous and nonferrous metal products	27	3.3	2.2	2.8
Processing and manufactures:	118	15.7	14.5	11.0
cement	15	5.0	4.4	2.8
Other industries	176	13.1	11.1	8.6
Total	1,333	100.0	100.0	100.0

Source: Reserve Bank of India Bul., Nov. 1965, as adapted by Ujagar S. Bawa, (see footnote 5, p. 8).

textiles comprised the bulk of the textile subgroup, amounting to about 77 percent, and the remaining 23 percent was contributed by jute, silk, and rayon, and woolen textiles together. Edible vegetable and hydrogenated oils, an important consumption-goods industry, contributed an extremely small value-added component — less than 1 percent. In the nonagricultural industries, iron and steel contributed about 7 percent to the total value added followed by 5 percent from the transport equipment industry.

Public sector undertakings were classified into 5 broad categories, with a total investment of Rs. 2037 crores (table 5). Departmental undertakings like the Chittaranjan Locomotive Works, Perambur Integral Coach Fac-

tory, ordnance factories, posts and telegraphs workshops, etc., were not included in the analysis of public sector undertakings. To study the importance of the different industry groups, attention was confined to "running concerns" which, essentially, contributed to the industrial productive activity and formed nearly 90 percent of the completed undertakings. Hindustan Steel Ltd. was a distinct category since it formed about 43 percent of the entire investment in undertakings covered by the above categorization.

Table 3. Investments in the public sector by categories, 1964–65

	(Rupees in crores)	Percent
Undertakings under construction	438.5	21.5
Running concerns—Hindustan Steel Ltd.	885.1	43.5
Running concerns—other than Hindustan Steel Ltd.	525.5	25.8
Promotional and developmental undertakings	181.9	8.9
Financial institutions	6.3	0.3
	2,037.3	100.0

Source: Government of India, Bureau of Public Enterprises, Department of Cabinet Affairs, Cabinet Secretariat. Annual report of the working of industrial and commercial undertakings of the central government for the year 1964–65, p. 4. New Delhi. 1966

The distribution of the total investment and gross value added by different industry groups is shown in table 4.

Table 4. Investment and gross value added in public sector industry groups, 1964–65

	Investment		Gross value added	
	rupees in crores			
Steel	890	(43.7)	64	(29)
Engineering	355	(17.4)	69	(31)
Chemicals	198	(9.7)	9	(4)
Petroleum	241	(11.8)	—	—
Mining and materials	158	(7.8)	5	(2)
Aviation and shipping	101	(5.0)	18	(8)
Financial institutions	6	(0.3)	—	—
Building and repairing ships	10	(0.5)	1	—
Miscellaneous	78	(3.8)	23	(10)
Special category*	—	—	35	(16)
Total	2,037	(100.0)	224	(100)

Figures within brackets show the percentage share of each industry group.

Source: See footnote to table 3.

*Undertakings with central government investment without direct responsibility for management.

An important indicator of the real performance of these projects was their contribution to the total value added. On the basis of the sample data, asset/value-added ratio in the public sector was more than twice that in the private sector (table 5). One of the explanations was that the public sector was in its infancy and that all the assets had not been utilized to generate output to the same extent as had those in the well-settled private sector. Secondly, the public sector included newer equipment and machinery purchased at much higher prices than their counterparts in the private sector.

Table 5. **Public and private sectors, asset/value-added ratios**

	Gross assets	Gross value added	Asset/value-added ratio
	rupees in crores		
Public sector	1709	224	7.7
Private sector	3444	1029	3.3

Source: See footnote to table 3.

Sources and Pattern of Saving

To measure saving, the Indian economy can be divided into 3 broad sectors: government sector, comprising central and state governments, local authorities, and departmentally owned as well as government commercial undertakings, government banks, and financial corporations; corporate sector, including joint stock companies in the private business sector, Industrial Credit and Investment Corporation, and cooperative institutions; and household sector, comprising individuals, noncorporate business (including agricultural sector), and private collectives such as temples, educational institutions, and charitable foundations. The household sector is further subdivided into rural sector and urban sector.[6]

Saving is defined, in accounting terms, as the change in earned surplus or earned net worth of an economic unit. It can be calculated either from the balance sheet as the change (excluding valuation changes) in net assets or from the income account as the excess of current income over current expenditure including distribution to owners. National savings is the sum of the changes in the earned net worth of all economic units, estimated either from the income account or from the balance sheet.

Saving of the corporate sector

The corporate sector consists of nonfinancial Indian joint stock com-

[6] For detailed treatment of sources and methods of estimating saving, see: Reserve Bank of India Bulletins, August 1961 and March 1965.

panies, banks, Industrial Credit and Investment Corporation of India, nonlife Indian insurance companies and cooperative institutions. Saving of the corporate sector includes saving of the subsidiaries of foreign companies; it does not include saving of the branches of foreign companies since they are not joint stock companies. To estimate domestic corporate saving, saving of the foreign joint stock companies would have to be deducted from saving of the corporate sector.

Saving of the corporate sector is represented by the retained earnings of this sector. Retained earnings are defined as follows: gross profits minus interest minus taxes minus disbursed dividends. The retained earnings can be obtained either from the profit and loss accounts of companies or from their balance sheets. From these accounts, the retained earnings are obtained by deduction of distributed profits from profits after tax. The retained earnings of the entire nonfinancial public limited companies sector are estimated by expanding, on the basis of paid-up capital, the retained earnings of a sample of public limited companies. Life insurance companies were regarded as mere conduits of saving; i e , their assets and liabilities were treated as if they were owned by their policyholders as a group, and variation in their net assets was taken to represent saving of the household sector. Thus no corporate saving came up through the life insurance companies. The retained earnings of the non-life-insurance companies were obtained from the Indian Insurance Year Book The retained profits of Indian scheduled and nonscheduled banks were estimated on the basis of their income and expenditure data published in the Reserve Bank's statistical tables relating to banks in India. From the balance of net profit or loss before tax were deducted the provisions for taxes on profits, distributed profits, bonus payments to employees, and payments of gratuity for future years with a view to estimating retained profits. The retained earnings of the Industrial Credit and Investment Corporation of India (ICICI) were estimated on the basis of its annual reports and accounts. The retained earnings of cooperative institutions were represented by the increases in their reserves and other funds, taken from the Reserve Bank publications *Statistical Statements Relating to the Cooperative Movement in India*. Thus the saving of the domestic corporate sector is the sum of saving from public and private limited companies, Indian banks (scheduled and nonscheduled), cooperative banks and institutions, non-life-insurance companies, and ICICI, minus retained earnings of Indian subsidiaries of foreign companies.

Table 6 shows the total saving for the economy and its breakdown into the 3 broad sectors.

Saving of the household sector

For estimating saving of the household sector, the method adopted was to find changes in the net assets held by this sector. Household saving is held in the form of (a) assets like currency, bank deposits and gold; (b)

Table 6. **Volume and pattern of saving, 1950–51 to 1962–63**

Year	Government sector	Domestic corporate sector	Household sector			Total saving
			Rural	Urban	Total	
	rupees in crores					
1950–51	89 (18)	32 (6)	148 (29)	234 (47)	382 (76)	503
1951–52	171 (35)	58 (12)	151 (31)	103 (22)	254 (53)	483
1952–53	98 (25)	1 (—)	156 (40)	138 (35)	294 (75)	393
1953–54	89 (16)	24 (5)	169 (31)	259 (48)	428 (79)	541
1954–55	100 (12)	53 (7)	171 (21)	493 (60)	664 (31)	817
1955–56	117 (12)	63 (6)	171 (17)	668 (65)	839 (82)	1019
1956–57	172 (16)	57 (5)	178 (17)	640 (62)	818 (79)	1047
1957–58	150 (20)	17 (2)	170 (22)	426 (56)	596 (78)	763
1958–59	127 (15)	30 (4)	189 (22)	515 (59)	704 (81)	861
1959–60	185 (18)	53 (5)	187 (19)	584 (58)	771 (77)	1009
1960–61	215 (17)	96 (8)	201 (16)	723 (59)	924 (75)	1235
1961–62	312 (26)	86 (7)	201 (17)	613 (50)	814 (67)	1212
1962–63	356 (27)	91 (7)	197 (15)	657 (51)	854 (66)	1301

Figures within parentheses show the percentage shares of different sectors.
Source: Reserve Bank of India Bul., p. 323, March 1965.

financial assets such as shares, securities, and insurance policies, and (c) physical assets such as house property, agricultural implements, etc.

According to the Reserve Bank of India, saving of the household sector averaged about 75 percent of the total saving during 1950–51 to 1962–63, while the shares of the government and the corporate sectors averaged about 20 percent and 5 percent respectively (table 6). The "household" category includes partnership and other noncorporate enterprises where business-group decisions may influence the level and use of saving. However, such noncorporate saving in urban areas have claimed well under 10 percent of the estimate of total household saving over the period.

The average ratio of saving to national income increased from 5.7 percent in 1950–51 to 9.8 in 1962–63 (table 7). There was, however, a slight decline in the ratio of saving to national income during 1951–52 and 1952–53, and again during 1957–58 and 1958–59, after rising steadily during 1953–54 to 1956–57. The explanation for this decline was that the years 1956–57 and 1957–58 were the initial years of the Second Plan, during which many investment schemes with a fairly long gestation period were adopted. During this gestation period, the distribution of increased money incomes would obviously lower the marginal profits/wages ratio, since the projects will not yield any profits during their construction phase. Because the marginal propensity to save out of wage incomes can be safely assumed to be lower than that to save out of profit incomes, the marginal saving/income ratio would tend to decline with the decline in the marginal profits/wages ratio. This tendency, expected to operate after a time lag, was visible particularly in 1957–58; it was re-

Table 7. **Volume and pattern of saving of household sector, 1950-51 to 1962-63**

Year	Currency	Net bank deposits	Insurance policies	Provident funds	Net claims on government sector	Corp. & coop. shares & securities	Total	Physical assets	Total: financial and physical
	rupees in crores, at 1948-49 prices								
1950-51	74 (19)	−35 (− 9)	17 (4)	30 (8)	−98 (−26)	31 (8)	19 (4)	363 (96)	382
1951-52	−105 (−41)	−41 (−16)	10 (4)	31 (12)	63 (25)	21 (9)	−21 (−8)	275 (108)	254
1952-53	− 22 (− 7)	27 (9)	17 (6)	41 (14)	−35 (−12)	13 (4)	41 (14)	253 (86)	294
1953-54	24 (6)	− 8 (− 2)	20 (5)	75 (18)	−54 (−13)	23 (6)	80 (20)	348 (80)	428
1954-55	91 (14)	34 (5)	25 (4)	93 (14)	44 (7)	41 (6)	328 (50)	336 (50)	664
1955-56	200 (24)	— (—)	29 (3)	91 (11)	32 (4)	54 (6)	406 (48)	433 (22)	839
1956-57	51 (6)	5 (1)	21 (3)	91 (11)	62 (8)	82 (10)	312 (39)	506 (61)	818
1957-58	43 (7)	53 (9)	24 (4)	98 (17)	40 (7)	51 (9)	309 (53)	287 (48)	596
1958-59	104 (15)	26 (4)	32 (5)	99 (14)	19 (3)	36 (5)	316 (46)	388 (54)	704
1959-60	119 (16)	58 (8)	40 (5)	103 (13)	−12 (− 2)	48 (6)	356 (46)	415 (54)	771
1960-61	144 (16)	− 5 (− 1)	45 (5)	136 (15)	19 (2)	53 (6)	392 (43)	532 (57)	924
1961-62	84 (10)	98 (12)	56 (7)	133 (16)	−19 (− 2)	69 (8)	421 (51)	393 (49)	814
1962-63	150 (18)	43 (5)	57 (7)	145 (17)	−24 (− 3)	56 (7)	427 (51)	427 (49)	854

Figures within parentheses represent percentage of household sector's saving.

Source: Reserve Bank of India Bul., p. 525, March 1965.

inforced by the rise in food prices, which led to the increase in wage incomes and the additional taxation, particularly, in the form of excise duties. Further, the rise in food prices affected adversely the real incomes and hence the capacity to save of the wage and salary earners in the non-agricultural sector. The operation of all these factors was further accentuated by a sharp drop in agricultural output and by the decline in profits in the cotton-textile industry, as a result partly of a decrease in the export of cotton textiles and partly of the lower domestic demand for cloth. The latter was due to the adverse effects on real incomes in the nonagricultural sector of a sustained rise in food prices. As a result of all these factors, saving of the corporate and the urban household sectors declined during 1957–58 and 1958–59, saving of the rural household sector also declined slightly. The increase in saving of the government sector was too small to offset the decline in saving of the other sectors. The volume of aggregate saving, therefore, declined substantially and the saving/income ratio dropped also.

The volume and pattern of saving of the household sector (urban and rural), which is the most important element in saving in the economy, are shown in table 7. This table shows the relative importance of financial and physical elements in saving of the household sector, and shows also that the financial component has grown considerably at the cost of physical component. The financial assets (currency, net bank deposits, provident funds, insurance policies, cooperative and corporate shares and securities, and net claims on government sector), which accounted for only 4 percent of the household sector's saving in 1950–51, rose to around 50 percent of this total in 1962–63. The physical assets (house property, agricultural implements, etc.) showed a complementary decline from 96 percent to 49 percent. Among the financial assets, "shares and securities and insurance policies" maintained almost constant proportions of the total, while the "provident funds" showed a definite increase during this period. The remaining components showed slight fluctuations around the average rates.

Investment in urban housing, which forms a part of "physical assets," is estimated on the assumption that the net rental return on urban housing is 7.17 percent. This assumption, as well as the share of urban housing income in the total income from house property, is based on the studies of the Central Statistical Organization (CSO) entitled *Proposals For a Revised Series of National Income Estimates for 1955–56 to 1959–60*, and *Estimates of Gross Capital Formation in India, 1948–49 to 1960–61*. Since estimates of urban rental income for the years 1950–51 to 1954–55 and 1960–61 to 1962–63 were not given in the CSO's above papers, they were derived by assuming that income from urban housing rose annually by 0.1 percent — the rate that corresponds to the average rate of growth of urban housing income from 1955–56 to 1959–60.

Relationship between national income and saving

The series of data on national income as estimated by the Central Statistical Organization and on saving estimated by the Reserve Bank of India are presented in table 8.

Table 8. National income and domestic saving, 1950–51 to 1962–63

Year	National income (Y)	Domestic saving (S)	Increment in income	Increment in saving	S/Y ratio
	rupees in crores				percent
1950–51	8,850	503			5.7
			250	(−) 20	
1951–52	9,100	483			5.3
			360	(−) 90	
1952–53	9,460	393			4.2
			570	148	
1953–54	10,030	541			5.4
			250	276	
1954–55	10,280	817			8.0
			200	202	
1955–56	10,480	1,019			9.7
			520	28	
1956–57	11,000	1,047			9.5
			(−) 110	(−) 274	
1957–58	10,890	763			7.0
			760	98	
1958–59	11,650	861			7.4
			210	148	
1959–60	11,860	1,009			8.5
			870	226	
1960–61	12,730	1,235			9.7
			330	(−) 23	
1961–62	13,060	1,212			9.3
			250	89	
1962–63	13,310	1,301			9.8

Sources: Government of India, Cabinet Secretariat, Department of Statistics, Central Statistical Organization, *Estimates of National Income*, Delhi, various issues. Reserve Bank of India Bul., p. 525. March 1965.

Trend lines fitted to national income (Y) and saving (S) data for 1950–51 to 1962–63 are shown in figure 1 and their equations are:

$$Y = 8350.76 + \underset{(15.125)}{375.16t} \qquad R^2 = .98$$

and

$$S = 358.88 + \underset{(10.20)}{71.63t} \qquad R^2 = .81$$

The rates of growth of national income and saving around their mean values, as computed from the trend lines, are 3.4 percent and 8.5 percent respectively. The marginal ratio of saving to income over the entire period is about 18.6 percent.

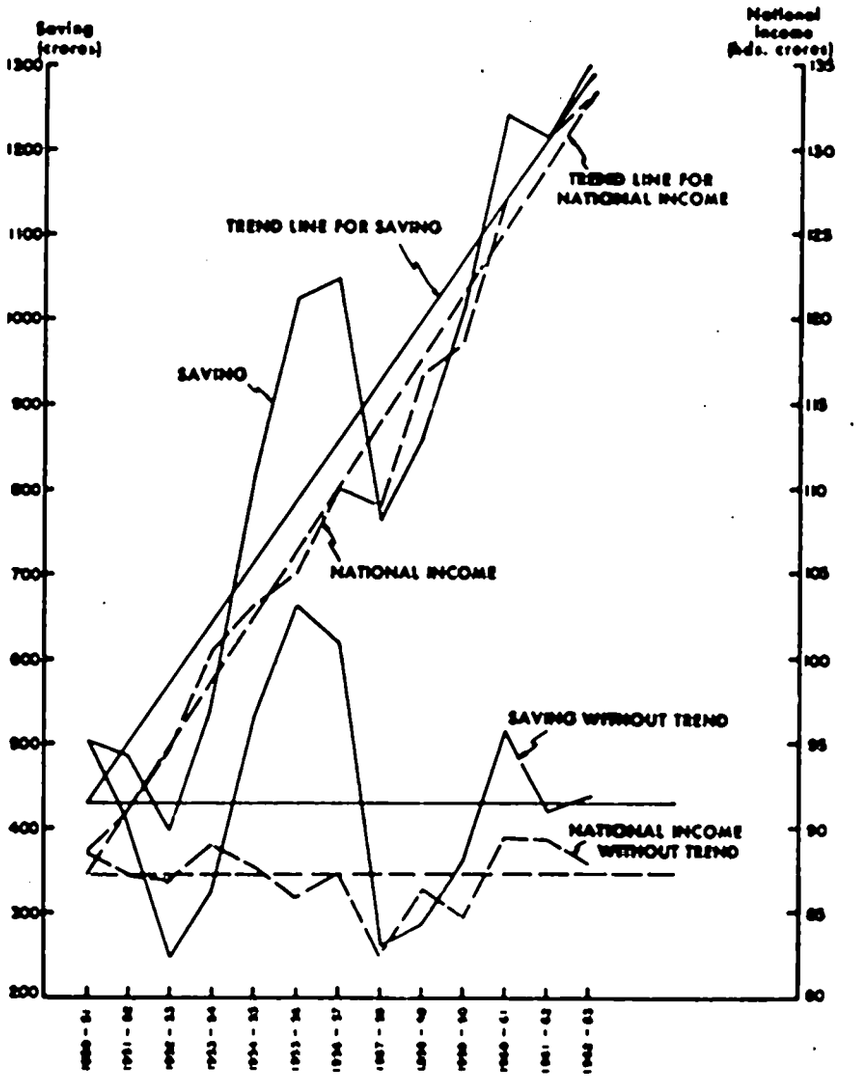

Figure 1. Relationship between national income and saving, 1950–51 to 1962–63 (at 1948–49 prices). Source: table 8.

The line of regression of saving on national income is:

$$S = -1241.67 + .1915Y$$
$$(.0255)$$

with a correlation coefficient of 0.91. The marginal saving/income ratio as calculated from this equation is 19.2 percent over the whole period,

as compared to 18.6 percent calculated above. Similarly, the average saving/income ratio is 7.7 percent from the regression equation, as compared to 7.8 percent worked out otherwise. With a marginal propensity to save of about 0.2, the investment multiplier amounts to about 5.

The saving/income relationship after removing the trend[1] becomes

$$S' = -4.56 + .050\ Y' \qquad r = .79$$
$$(.018)$$

showing that even in terms of short-run fluctuations, the correlation between saving and income is fairly high but not as high as when including the secular trends.

Relationship between agricultural production and national income

The data regarding the relationship of income from agriculture as a proportion of the national income are given in table 9.

During the period 1949–50 to 1964–65, the national income increased at a moderate rate of about 3 percent, whereas the income from agriculture increased at an annual rate of 1.2 percent. The contribution of agriculture to the net national output has been declining during this period from about 49 percent in 1949–50 to 43 percent in 1964–65.

The relationships of national income with agricultural production and food-grains production from regression analysis are as follows:

$$Y = -9.64 + 1.136\ X^a \qquad r = .97$$
$$(.071)$$

$$Y = -8.98 + 1.166\ X^f \qquad r = .94$$
$$(.117)$$

These relationships, after eliminating the trend, become:

$$Y' = 66.39 + .348\ X'^a \qquad r = .51$$
$$(.165)$$

and $$Y' = 83.34 + .176\ X'^f \qquad r = .34$$
$$(.134)$$

where X'^a, X'^f and Y' are the agricultural production, food-grains production and the national income after eliminating the trends. As expected, there is a strong positive correlation between the national income and agricultural production and food-grains production, the former being the stronger. The correlations do not remain so strong after the trend is extracted. The lines of regression for national income on agricultural production and on food-grains production run parallel to each other. It should be immaterial to pick either of them to explain national-income

[1]Notationally, the variables after extracting their trend have a prime on them.

Table 9. **Agricultural and national income, 1949–50 to 1964–65**

Year (1)	National income (at 1948–49 prices) (2)	Income from agri-cultural (at 1948–49 prices) (3)	(3) as a per-centage of (2) (4)	Index of: Agri-cultural production (1949 = 100) (5)	Index of: Food-grains production (1949 = 100) (6)	National income (1948–49 = 100) (7)
	100 crores of rupees					
1949–50	88.2	43.6	49.4	100.0	100.0	100.0
1950–51	88 5	43.4	49.0	95.6	90.5	102.3
1951–52	91.0	44.4	48.8	97.5	91.1	105.2
1952–53	94.6	46.0	48 6	102.0	101.1	109.4
1953–54	100.3	49 8	49.7	114.3	119.1	116.0
1954–55	102.8	50.3	48.9	117.3	115.0	118.8
1955–56	104.8	50.2	47.9	116.8	115.3	121.2
1956–57	110.0	52.5	47.7	124.3	120.8	127.2
1957–58	108.9	50.1	46 0	115.9	109.2	125.9
1958–59	116.5	55.6	47.7	133 9	130.6	134.7
1959–60	118.6	55.1	46.5	130.3	127.9	137.1
1960–61	127.3	59.0	46.3	142.2	137.1	147.2
1961–62	130.6	59.1	45.3	144.8	140.3	151.0
1962–63	133 1	57.9	43.5	137.5	130.4	153.9
1963–64	139.7	59.7	42.7	142 6	135.9	161.5
1964–65	150.5	65.0	43.2	157.6	149.1	174.0

Sources: Government of India, Cabinet Secretariat, Department of Statistics, Central Statistical Organization, *Estimates of National Income.*

Government of India, Ministry of Food and Agriculture, Directorate of Economics and Statistics, *Agricultural Situation in India*, pp. 416–417. New Delhi, Aug. 1965.

Reserve Bank of India Bulletin, April 1966.

behavior. The correlation, however, is slightly better between Y and X^a than between Y and X^f.

Relationships between saving, agricultural production, and terms of trade

The trends and the growth rates of saving and agricultural production are summarized in table 10.

The relationships between different sources of saving are shown in figure 2, and simple regression equations, after removing the trend, are given below:

$$S'^{rb} = 147.28 + \underset{(.063)}{.068}\ S'^{a} \qquad r = .31$$

(continued)

$$S'^{uh} = 148.40 + \underset{(1.502)}{2.142}\ S'^{c} \qquad r = .40$$

$$S'^{h} = 295.71 + \underset{(1.617)}{2.228}\ S'^{c} \qquad r = .40$$

where S_c, S^h, S^{uh}, S^{rh}, and S^t represent corporate saving, household saving, urban and rural household saving, and total domestic savings, respectively.

Table 10. Estimates of trend coefficients for saving, agricultural production, and ratio of agricultural to manufactures' prices, 1950-51 to 1962-63

Saving	Trend value	Growth rate
	Rs. in crores	percent
Corporate sector S^c	4.78	9.4
Rural households S'^{rh}	4.47	.5
Urban households S^{uh}	45.08	9.3
Total households S^h	49.55	7.7
Domestic total savings S^t	71.63	8.3
Agricultural production X^a (percent)	4.01	3.3
Relative prices: p^a/p^m	−.58	−.6

Source: Tables 6, 9, 21.

The correlation between saving in the corporate sector and in the urban household sector, and also between saving in the corporate and total-households sectors, is .4 each and is higher than the correlation between saving in the corporate and rural household sectors. The correlation between saving in the domestic corporate sector and the urban household sector is real and important because the former may be increasing its saving for the same reasons as those for the total households sector. On the other hand, the factors that encourage increased corporate saving would initiate more new issues. These issues (cooperative and corporate shares and securities), which form about 7 percent of the household sector's saving, would encourage saving trends there.

The relationship between different sources of saving and agricultural production and the terms of trade are also illustrated in figure 2. The regression equations fitted after extracting the trend from all the variables, are presented below:

Agricultural production:

$$S^c = -79.08 + \underset{(1.351)}{1.043}\ X^a \qquad r = .23$$

$$S'^{rh} = 53.82 + \underset{(.072)}{.980}\ X^a \qquad r = .97$$

(continued)

$S^{ah} = -761.06 + 9.869\ X^a$ (6.905) $r = .40$

$S^h = -717.30 + 10.960\ X^a$ (6.896) $r = .43$

$S^t = -355.93 + 8.115\ X^a$ (6.677) $r = .30$

Relative prices:

$S^a = 123.94 - .981\ p^a/p^m$ (1.051) $r = .27$

$S^{ch} = 142.10 + .064\ p^a/p^m$ (.238) $r = .08$

$S^{ah} = 897.32 - 6.755\ p^a/p^m$ (5.555) $r = .34$

$S^h = 1036.87 - 6.662\ p^a/p^m$ (5.671) $r = .33$

$X^t = 1285.02 - 8.224\ p^a/p^m$ (5.859) $r = .39$

There is almost perfect correlation, as would be expected, between saving in the rural households and agricultural production. The correlation coefficient between agricultural production and corporate saving is low at .23, whereas those for the urban households and the total households sectors are .40 and .43. There is a positive correlation of .3 between agricultural production and domestic saving.

The "terms of trade" p^a/p^m is almost uncorrelated with the rural household saving and bears an inverse relationship with corporate, urban household, total households, and domestic corporate sectors, with correlation coefficients of .27, .23, .33, and .39. The relationships presented in figure 2 show better correlations between agricultural production, domestic terms of trade, and the saving components than those described above, because of trend factor. These coefficients indicate the relationships in terms of short-run fluctuations between different variables after trend has been eliminated from their time series, the presence of which was boosting the correlations of these variables.

Sources of Capital in the Private Industrial Sector

The main sources of gross capital formation in the organized industries sector, which represents between 80 and 85 percent of the entire private industrial sector, are industrial borrowings and depreciation provision. The relative share of small public limited companies in terms of profits, borrowings, and depreciation in the total corporate sector is small and

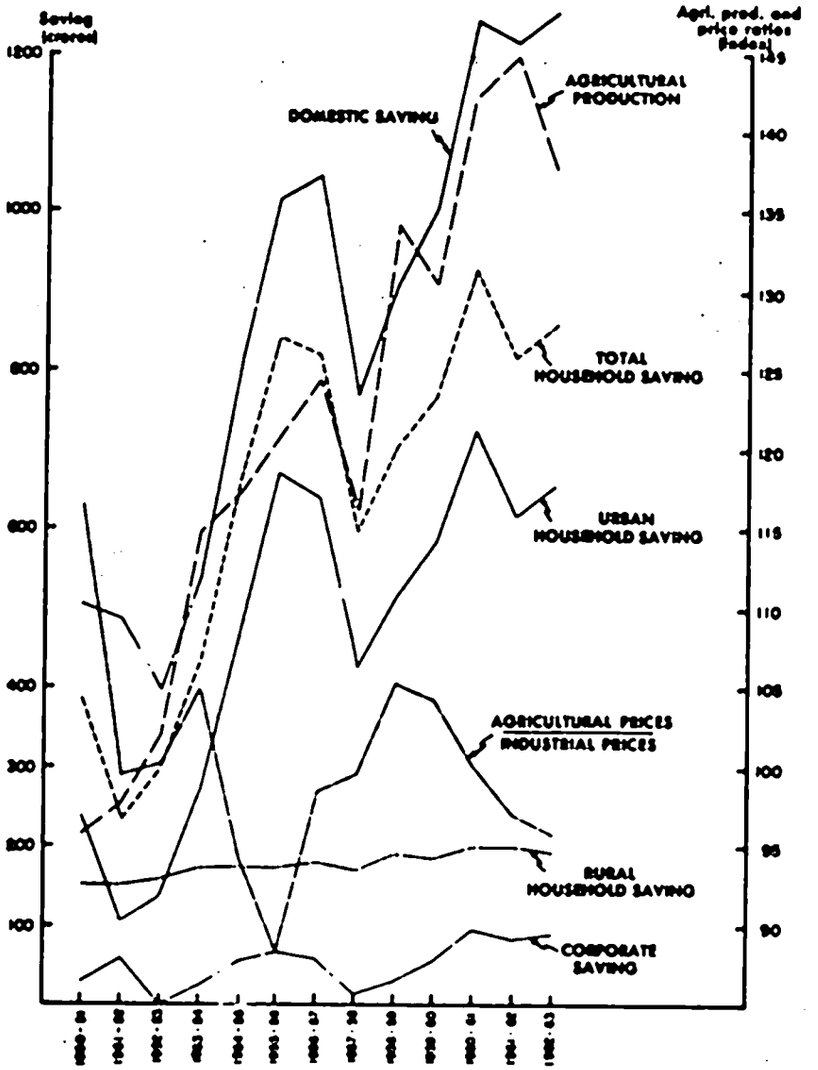

Figure 2. Relationship between saving, agricultural production, and relative prices, 1951–52 to 1962–63. Source: tables 5, 7, and 21.

has been omitted from this analysis. The relevant data relating to large public limited companies appropriately expanded to represent the entire nonfinancial, nongovernment corporate sector are presented in table 11.

Table 11. **Sources of investment, private industrial sector, 1951-52 to 1964-65**

Year	Retained profits	Depreciation allowance	Borrowings	Total	Gross capital formation	(Profits + Investments × 100)
	rupees in crores at current prices					
1951-52	38 (28)	42 (31)	55 (41)	135	141	27
1952-53	11 (30)	41 (111)	(−) 15 (−) (41)	37	41	27
1953-54	20 (30)	44 (67)	2 (3)	66	52	38
1954-55	26 (22)	45 (38)	47 (40)	118	112	23
1955-56	44 (30)	53 (37)	48 (33)	145	158	28
1956-57	38 (17)	55 (25)	127 (58)	220	299	13
1957-58	18 (8)	62 (29)	133 (63)	213	296	6
1958-59	24 (16)	69 (46)	56 (38)	149	197	12
1959-60	50 (39)	73 (57)	6 (4)	129	155	32
1960-61	67 (24)	123 (44)	88 (32)	278	287	23
1961-62	65 (22)	142 (48)	91 (30)	298	363	18
1962-63	54 (16)	153 (46)	125 (38)	332	365	15
1963-64	73 (19)	174 (45)	141 (36)	388	409	18
1964-65	78 (17)	199 (45)	170 (38)	447	428	18

Figures within parentheses show the percentage shares.

Source: Reserve Bank of India Monthly Bulletin, September 1957, June 1962 and November 1966.

The net retained profits, internal resources, and total investible funds are defined below:

- Sales proceeds + other income + closing stocks of finished goods and work-in-progress = gross income.
- Opening stocks of finished goods and the work-in-progress + raw materials + salaries and wage benefits, + bad debts + excise duties and cess + other manufacturing expenses = working expenses.
- Gross income − working expenses − depreciation = gross profits.
- Gross profits − interest − managing agents' remuneration = profits before tax.
- Profits before tax − tax provision = profits after tax.
- Profits after tax − disbursed dividends = net retained profits.
- Net retained profits + depreciation allowance − replacement expenditure = internal resources.
- Internal resources + loans and borrowings, + investments by government = total investible funds.

Borrowings include those from banks, statutory financial corporations, debentures, mortgages, and others. The equities have been excluded from borrowings because the shares of working capital and actual investments out of the equities' fund are not known. The "total" in table 11 is supposed to represent the available resources for financing capital formation, but this does not tally exactly with the actual capital formation. One explanation for this discrepancy could be the different depreciation allowances and incomplete replacement expenditure in the company balance-sheet analysis for the same year and for the same set of companies.

The profits and borrowings as percentages of total supply of investment funds are shown in table 11. For the period 1951–52 to 1964–65, the proportion of retained profits did not vary much around its mean value of 21 percent, except for 1957–58 when profits supplied only about 8 percent of the investments. That year, borrowings were the highest as a proportion of the total investible funds. Over the entire period under consideration, borrowings constituted about 36 percent, retained profits 21 percent, and the depreciation allowance 43 percent of the total supply of investments.

The coefficient, $\frac{\text{retained profits}}{\text{investments}} \times 100$, works out as 18 percent for the entire period.

The trend values and the rates of growth of real profits, borrowings, depreciation, and the investments are summarized in table 12.

The rate of increase of gross investments over the years 1951–52 to 1964–65 was about 10 percent, and that for profits was 8 percent per year; this lower supply of self-investment funds was compensated by a higher rate of 10.6 percent of borrowings to meet investment demand. The rates of growth of depreciation, borrowings, and profits appropriately weighted would give approximately the rate of growth of investment.

Table 12. Estimates of trend values and rates of growth for profits, borrowings and investments, private organized sector, 1951-52 to 1964-65

	Trend value	Rate of growth
	Rs. in crores	percent
Profits	3.09	8.0
Borrowings	7.26	10.6
Investments	20.76	9.8
Profit + investments (percent)	−1.64	−4.1
Depreciation	11.16	18.6

Source: Table 11 modified in terms of constant prices.

For increasing profits, increasing income is a prerequisite and is borne out by the following relationship:

$$\pi^{or} = -2.10 + .014\ Y^{or} \quad (.003)$$

where π^{or} are the real retained profits and Y^{or} the real income for the industrial sector from the sale proceeds, closing stocks, and other incomes to the enterprise. The correlation coefficient between π^{or} and Y^{or} is 0.85, significant at even a 1 percent level of statistical significance. This correlation reduces to .5 if the trend is removed from both these variables but still the regression coefficient of π on Y is significant at 5 percent, as is seen from the revised fit:

$$\pi'^{or} = -2.13 + .025\ Y'^{or} \quad (.012)$$

The regression of borrowings on the money supply shows a significant regression coefficient with a correlation coefficient of 0.75. The linear regression equation in this case is:

$$B^{or} = -77.34 + .059\ m \quad (.015)$$

where B^{or} is the borrowings by the industrial sector and m is the money supply with the public, both variables being at current prices. Borrowings and money-supply equation after extracting trends gives a correlation coefficient of .4, showing that the existence of trends in both these variables was increasing their correlation. The revised equation is

$$B'^{or} = -130.94 + .098\ m' \quad (.056)$$

The elasticity of borrowings with respect to money supply shows that a 1 percent change in money supply is accompanied by a .9 percent change in the borrowings.

Profits and borrowings can be complementary in some situations and supplementary in others. Borrowings may increase when profits increase

because it is profitable to invest more than what profits alone would allow. On the other hand, if profits decrease, borrowings may have to increase to provide operating funds. As a result, the line of regression of profits on borrowings shows little relationship once the trend is removed:

$$\pi'^{or} = 17.33 + \underset{(.103)}{.006}\ B'^{or} \qquad r = \text{negligible}$$

Sources of Capital in the Public Industrial Sector

Sources of capital for the public industrial sector are shown in table 13. The investment in the public sector from year to year differs from capital formation shown by the total in column 5 of table 13 to the extent of changes in working capital, financial investments, and deferred revenue expenditure.

Table 13. Sources of capital, public industrial sector, 1960–61 to 1964–65

Year	Retained profits (1)	Borrowings (2)	Changes in equity capital (3)	Depreciation (4)	Total (5)
	rupees in crores at current prices				
1960–61	7.51	4.16	26.15	52.97	90.79
	(8.3)	(4.6)	(28.8)	(58.3)	
1961–62	6.61	74.84	24.40	40.80	146.65
	(4.5)	(51.0)	(16.6)	(27.9)	
1962–63	13.20	52.06	73.97	52.95	192.18
	(6.9)	(27.1)	(38.5)	(27.5)	
1963–64	15.51	50.24	279.74	54.70	400.19
	(3.9)	(12.6)	(69.9)	(13.6)	
1964–65	16.82	89.47	349.13	69.32	524.74
	(3.2)	(17.1)	(66.5)	(13.2)	
1965–66	59.65	270.77	753.39	270.74	1354.55
	(4.4)	(20.0)	(55.6)	(20.0)	

Figures within brackets are the percentage shares of different sources in each year.
Source: See footnote to table 3.

Because of the limited profits, the bulk of the investments are financed through different forms of borrowings, changes in equity capital (some of it is earmarked for working capital), and the depreciation fund. The total borrowings account for nearly 75 percent of the total supply of investible funds for the public sector, as against 36 percent for the private sector. The main reason for this differential is that the public sector is in its infancy and requires unusually large sums from outside because it is unable to generate enough finances of its own.

Table 14 compares capital expenditure in the public sector, aggregate domestic saving, and external assistance.

Table 14. **Public capital expenditure, aggregate domestic saving, and external assistance, 1951–52 to 1962–63**

Year	Capital disbursement (central and state governments)	Aggregate saving	External assistance	
			with P.L. assistance	without P.L. assistance
	rupees in crores at 1948–49 prices			
1951–52	440	483	16	15
1952–53	303	393	27	26
1953–54	463	541	31	30
1954–55	827	817	52	51
1955–56	847	1019	76	75
1956–57	1041	1047	145	106
1957–58	1220	763	257	131
1958–59	1153	861	276	195
1959–60	1342	1009	338	234
1960–61	1471	1235	419	224
1961–62	1626	1212	339	251
1962–63	1906	1301	449	326

Sources: (1) Government of India, Ministry of Finance. Budgets of the states and central governments.
(2) Reserve Bank of India Bul., March 1965.

The trend lines fitted to the data for capital expenditure, external assistance, and saving show the following results:

Table 15. **Estimates of trend values and rates of growth of capital disbursements in the public sector, aggregate savings and external assistance, 1951–52 to 1962–63**

	Trend value	Rate of growth
	Rs. in crores	percent
Capital disbursement I^g	135.5	12.9
Aggregate saving: S^t	74.9	8.4
External assistance:		
(1) including P.L. 480	43.5	21.5
(2) excluding P.L. 480	28.3	20.4

Source: Table 14.

This confirms an obvious result: the aggregate saving was not adequate to meet the needs even of capital expenditure in the public sector, much less for the entire economy. Foreign assistance filled the gap. The regression equation of public-sector capital expenditure (I^g) and aggregate saving (S^t) is:

$$I^g = -281.89 + \underset{(0.22)}{1.5}S^t \qquad r = .91$$

which, after removing the trend in both variables, becomes

$$I'^{g} = 29.42 + .479\ S'^{t} \qquad r = .53$$
$$(.126)$$

This confirms the expected results that I^{g} and S^{t} have a statistically significant regression coefficient. Similarly, the external assistance has a high correlation, with I^{g}.

The higher rate of growth for the total external aid (including and excluding P.L. 480), in relation to the growth rate for I^{g} shows the compensating role of the former for financing the public sector investment outlays. The regression lines of I^{g} on external aid are:

$$I^{g} = 466.07 + 2.91\ F$$
$$(.31)$$

and $$I^{g} = 417.86 + 4.58\ F^{\bullet}$$
$$(.42)$$

where F stands for external assistance including P.L. 480 assistance and $F^{\bullet}$ without P.L. 480. The regression coefficients are statistically significant at the 5 percent levels of significance. The correlation coefficients between I^{g} and F and I^{g} and $F^{\bullet}$ are fairly high at 0.95 and 0.96 respectively. The high correlations were the result of the presence of trend in both these variables. These equations after removing the trend become:

$$I'^{g} = 361.92 + 1.048\ F \qquad r = .56$$
$$(.045)$$

$$I'^{g} = 338.73 + 1.601\ F^{\bullet} \qquad r = .63$$
$$(.568)$$

Although the correlation coefficients are reduced to .56 and .63 after removing the trend, the conclusion that foreign assistance has much to do with the public sector capital disbursements, still holds.

Agricultural production and public-sector investments

Agricultural production may be influenced by the level of public sector total investments. The data relating to these 2 variables for the period 1951–52 to 1964–65 are presented in table 16.

The linear regression of agricultural production (X^{a}) on public capital expenditure (I^{g}) based on the above data, after removing the trend, works out as follows:

$$X'^{a} = 104.93 - .008\ I'^{g} \qquad r = -.18$$
$$(.012)$$

The regression coefficient is not statistically significant. There is little correlation between agricultural production and government capital expenditure.

Assuming that a straight-line equation is a reasonably good empirical statement of the relation between agricultural production and foreign

Table 16. **Agricultural production, public-sector investment, and foreign aid, 1951–52 to 1964–65**

Year	Index of agricultural production	Capital expenditure* (public sector)	External aid	
			with P.L.	without P.L.
		rupees in crores		
1951–52	97.5	440	16	15
1952–53	102 0	303	27	26
1953–54	114.3	463	31	30
1954–55	117.0	827	52	51
1955–56	116.8	847	76	75
1956–57	124.3	1,041	145	106
1957–58	115.9	1,220	257	131
1958–59	133.5	1,153	276	195
1959–60	127.9	1,342	338	234
1960–61	137.1	1,471	419	224
1961–62	140.3	1,626	339	251
1962–63	130.4	1,906	449	326
1963–64	135.9	2,171	594	409
1964–65	150 2	2,330	718	503

*At 1948–49 prices.

Sources: (1) Reserve Bank of India bulletins.

(2) Government of India, Ministry of Finance. Budgets of the central government. New Delhi.

(3) Government of India, Ministry of Food and Agriculture, Directorate of Economics and Statistics. Agricultural situation in India. New Delhi, Aug. 1965.

assistance with and without the P.L. 480 component, a linear regression has been fitted, after eliminating trends, with the following results:

$$X'^{a} = 102.05 - \underset{(.023)}{.010}\ F \qquad r = .12$$

and

$$X'^{a} = 102.27 - \underset{(.032)}{.010}\ F^{\bullet} \qquad r = .09$$

where F and F* stand for external aid with and without P.L. 480, and X^a is the agricultural production index. The regression coefficients in both these equations are not statistically significant at the 5 percent level of significance, and there is an insignificant correlation between X'^a and foreign assistance.

Foreign aid has been very little concerned with the agricultural sector. The main effect of foreign aid in regard to agriculture has been through P.L. 480, which has kept agricultural prices down somewhat and, therefore, may have resulted in a declining trend in agricultural production.

Annexure to Chapter II

Classification of Manufacturing Industries Adopted by the Reserve Bank of India*

1. Agriculture and allied activities
   - Tea plantations
   - Coffee plantations
   - Rubber plantations
2. Mining and quarrying
   - Coal mining
3. Processing and manufacture—foodstuffs, textiles, leather and products thereof
   - Grains and pulse
   - Edible vegetable and hydrogenated oils
   - Sugar
   - Tobacco
   - Cotton textiles
   - Jute textiles
   - Silk and rayon textiles
   - Woolen textiles
4. Processing and manufacture—metals, chemicals and products thereof
   - Iron and steel
   - Aluminum
   - Nonferrous metals
   - Transport equipment
   - Electrical machinery, apparatus, appliances, etc.
   - Machinery (other than transport and electrical)
   - Foundries and engineering workshops
   - Ferrous/nonferrous metal products
   - Basic industrial chemicals
   - Medicines and pharmaceutical preparations
   - Other chemical products
   - Matches
5. Processing and manufacture—not elsewhere classified
   - Mineral oils
   - Cement
   - Pottery, china, and earthenware, etc.
   - Rubber and rubber manufactures
   - Paper and paper products
6. Other industries
   - Construction
   - Electricity generation and supply
   - Trading
   - Land and estate
   - Shipping
   - Hotels, restaurants, and eating houses

*Reserve Bank of India, November 1965.

Chapter III. Means of Agricultural Contribution to Industrial Capital Formation

The channels by which agriculture contributes to industrial capital formation are direct investment by farmers, taxes, and the price mechanism. Taxes and price mechanisms are discussed in this chapter. Unfortunately, there are insufficient data to permit discussion of direct investment by farmers in industry. Such investment is, presumably, primarily in the small-scale-industries sector, which forms only 10 to 15 percent of the total industrial sector, although recently it has been growing rapidly.

Taxes

Table 17 represents the average ratio of taxes to income in the agricultural and nonagricultural sectors for 1950–51 to 1964–65. It is clear from this table that during all these years, on an average, the agricultural sector has been paying between 3.5 to 7 percent of its income as taxes, while the nonagricultural sector has been paying more than double this percentage. According to Gandhi,[8] the inequality involved would be more

Table 17. **Ratio of taxes to income for agricultural and nonagricultural sectors, 1950–51 to 1964–65**

Year	Agricultural sector	Nonagricultural sector
1950–51	3.6	8.8
1951–52	3.8	9.5
1952–53	4.2	8.9
1953–54	4.0	8.8
1954–55	5.1	9.1
1955–56	5.4	8.8
1956–57	5.1	9.9
1957–58	6.2	13.7
1958–59	5.5	11.6
1959–60	5.9	14.3
1960–61	5.6	13.1
1961–62	5.7	14.4
1962–63	6.9	16.2
1963–64	6.9	18.2
1964–65	5.6	18.3

Sources: (1) See footnote 5, p. 8, Bawa, U.S., tables 4.1, 4.2, 4.5.
(2) See footnote 8 below, Gandhi, V. P., pp. 86–87.
(3) Reserve Bank of India Bulletin, April 1966, p. 596.

[8] Gandhi, V. P. Tax burden in Indian agriculture. p. 27. Intnl. Prog. Taxation, Harvard Law School. Cambridge, Mass. 1966.

obvious if the marginal tax burden were calculated. Defining the marginal tax burden as the ratio of additional taxes to additional income for the period 1950–51 to 1964–65, the marginal tax burden for the agricultural sector was only 7.5 percent, while that for nonagriculture was as much as 44 percent. This shows how disproportionately the nonagricultural sector has been bearing the burden of additional taxes imposed to finance the process of economic development. The implication is that the transfer capital from the agricultural to the nonagricultural sector, for which additional taxation is considered an efficient means, has not been effective. The taxation rate in the agricultural sector has been lower than that in the nonagricultural sector; in particular, the richer sections of the agricultural sector were favored under the present tax system in which the tax is proportional in character, as compared with the richer sections of the nonagricultural sector, where taxation is progessive.

Investment and Productivity in Agriculture

Investment in agriculture is defined as the sum of private investments on farms, of the nonmonetized component, and the government investment (table 18). Agricultural investment increased 40 to 45 percent between 1950 and 1961 (taking 3-year moving averages). The nonmonetized investment has been assumed to have remained a constant proportion of 1.5 percent of the national income. Even the investment per worker in agriculture, defined as the ratio of the index of agricultural investment to the index of workers in agriculture, has risen during 1950–1961 by 12 to 15 percent. In comparison, the productivity per worker, defined as the ratio of the index of agricultural production to the index of workers in the agricultural sector, has improved by only 5 percent.

Theoretically, it is expected that a capital-scarce agriculture like that of India, with the injection of more capital, will yield increasing returns per worker. But the government investment in agriculture, particularly during the first 2 five-year plans, was not very productive. Private investment on farms and the index of agricultural workers, however, increased fairly rapidly (table 18).

The short-run fluctuations, necessarily extracting the trend factor from the time-series data, relating to private farm investments and different kinds of savings are described by the following linear regression equations:

$$I^{pr(a)} = 44.04 + .480\ S^{ph} \qquad R^2 = .77$$
$$(.086)$$

$$I^{pr(a)} = 121.08 - .027\ S^{ph} \qquad R^2 = .11$$
$$(.025)$$

$$I^{pr(a)} = 122.16 - .017\ S^{h} \qquad R^2 = .04$$
$$(.027)$$

(continued)

$$I^{pr(a)} = 101.34 + .053\ S^{h(ph)} \qquad R^2 = .19$$
$$(.036)$$

$$I^{pr(a)} = 116.67 + .001\ S^{t} \qquad R^2 = \text{negligible}$$
$$(.025)$$

where I^{a} = agricultural investment,
$I^{pr(a)}$ = private farm investment,
X^{a} = agricultural production,

and S^{rh}, S^{uh}, and S^{h} are the savings in the rural-household, urban-household, and total household sectors, while $S^{h(ph)}$ and S^{t} represent the physical form of household savings and total savings respectively.

Savings in the rural household sector have a high correlation of .9 with the private farm investment; the former is the chief source of financing for the latter.

Incidence of Current Public Expenditure

In the allocation of the current expenditure into agricultural nonagricultural sectors, Gandhi[9] made the following assumptions: (1) Expenditures on common wants such as civil administration, defense, relief from famines, and miscellaneous items were allocated to the 2 sectors equally, on the premise that all people enjoy their real benefits equally. Monetarily, perhaps, the nonagricultural sector benefits more than the agricultural sector. It can be argued, however, that this allocation to the 2 sectors could have been done in proportion to the population of respective sectors, which was more meaningful than simply equal proportions. (2) Expenditures such as those for agriculture, veterinary services, cooperation, rural and community development projects, Grow More Food Campaign schemes, and relief from natural calamities such as floods have been allocated entirely to the agricultural sector. (3) Expenditures on education, medical and public health, and social development were allocated on the basis of the population in the two sectors. This is a rough allocation of government current expenditure, but it does give some idea of the pattern of expenditure. Relative magnitudes of expenditures for the 2 sectors rather than their absolute amounts are important for our purpose.

Table 19 gives the magnitudes of current expenditures for the 2 sectors as estimated above. In 1950–51 the amount of current public expenditure was equal in the 2 sectors, but in 1962–63 it became 15 percent higher in the agricultural sector than in the nonagricultural sector.

[9]See footnote 8, p. 32, Gandhi, V. P., chapt. 4.

Table 18. **Investment in agriculture, 1950-51 to 1960-61**

Year	Private investment on farms	Non-monetized investment	Government investment	Total investment	Index of investment (1950-51 = 100)	Index of workers in agricultural sector (1950-51 = 100)	Index of investment per worker (1950-51 = 100)	Index of agricultural production
	rupees in crores at current prices							
1950-51	122.76	142.0	50.0	315	100.0	100.0	100.0	95.6
1951-52	126.00	149.0	55.7	331	105.1	103.9	101.2	97.5
1952-53	120.73	147.0	76.6	345	108.9	106.0	102.6	102.0
1953-54	133.28	157.0	87.1	377	119.5	108.9	109.6	114.3
1954-55	109.19	144.0	98.8	352	111.8	111.9	99.9	117.3
1955-56	113 45	150.0	146.2	410	130.1	115.2	112.9	116.8
1956-57	138 55	170 0	155.0	464	147.3	118.9	123.8	124.3
1957-58	133.78	171.0	131.6	437	138.8	122.5	113.3	115.9
1958-59	135 00	189.0	114.0	438	139.5	126.3	110 5	133.9
1959-60	140.00	193 0	124.1	457	145.8	130.6	111.6	130.3
1960-61	151.00	213.0	147.4	512	162.6	135.1	120.4	142.2

Sources: (1) See footnote 5, p. 8, Bawa, U.S., table 4.4.
(2) See footnote 8, p. 52, Gandhi, V. P., p. 156.

Table 19. **Government expenditure on current account, agriculture and nonagriculture, 1950–51 to 1962–63**

Year	Agricultural sector	Nonagricultural sector	Total
	rupees in crores		
1950–51	286 (50.0)	286 (50.0)	572
1951–52	325 (50.0)	325 (50.0)	650
1952–53	315 (49.5)	321 (50.5)	636
1953–54	330 (50.3)	325 (49.7)	655
1954–55	350 (50.4)	345 (49.6)	695
1955–56	373 (51.7)	349 (48 3)	722
1956–57	443 (52.9)	395 (47.1)	838
1957–58	520 (51.5)	490 (48 5)	1,010
1958–59	573 (53.6)	496 (46 4)	1,069
1959–60	606 (50 3)	599 (49.7)	1,205
1960–61	721 (54.5)	602 (45 5)	1,323
1961–62	781 (54 5)	651 (45 5)	1,432
1962–63	821 (54 4)	689 (45.6)	1,510

Figures in parentheses represent percentages.

Sources: (1) See footnote 5, p. 8, Bawa, U.S., table 4.8.
(2) See footnote 8, p 32, Gandhi, V. P., p. 116.

Prices and Price Ratios

Table 20 contains the coefficients of price trend of different commodity groups. As has been pointed out by Dar,[10] the coefficients suffer from errors due to sharp fluctuations in prices from year to year, and so a comparison between coefficients would not be dependable. But if the causes of fluctuations in prices of different commodities, such as climate and money supply, are similar and consequently the direction of change in the prices is similar, the values of coefficients become more meaningful. The period covered in this study is 1950–51 to 1965–66. There was a sharp increase in the prices of industrial-raw-material crops—cotton, oilseeds, and jute—in connection with the Korean War, culminating in 1951–52. These prices dropped precipitately in 1952–53, essentially back to the pre-Korean-War levels. This particular phenomenon was less relevant for most other prices in India. Thus price trends for industrial-material crops are biased down slightly in relation to other prices.

The broad conclusions regarding price movements of commodity groups are that: (1) prices of food grains and food articles (including food grains) increased the most; (2) manufactures' prices increased the least; (3) price rises of industrial raw materials were between those of food articles and

[10] Dar, A. K. Domestic terms of trade and economic development of India, 1952–53 to 1964–65. Cornell Intnl. Agr. Dev. Bul. 12. N.Y. State Coll. Agr., Cornell Univ., Ithaca, N. Y. 1968.

Table 20. **Estimates of trend coefficients for prices of different commodity groups, 1950–51 to 1965–66**

(Base period 1952-53 = 100)

Commodity group	Trend value	Growth rate*
	points	percent
Food articles	3.62	3.1
Industrial raw materials	3.51	2.7
Agricultural commodities	3.14	2.6
Food grains	2.95	2.8
Manufacturers	2.71	2.4

Sources: (1) Government of India, Ministry of Finance, Budget for 1964–65, p. 255.
(2) Reserve Bank of India. Reports on currency and finance, statement 18. Bombay. 958–59; ibid. 1964–65: S21, S22.
(3) Reserve Bank of India. Reports on currency and finance. Bombay, 1965–66.

*Defined as $\frac{dP}{dt} / P$, where P is the average of index of prices over the period under reference and $\frac{dP}{dt}$ is the value of the trend coefficient.

manufactures; and (4) the prices of all agricultural commodities showed a smaller rise than those of the food articles, implying that the prices of food articles increased more sharply than those of nonfood articles.

The price ratios of agricultural commodities, food articles, food grains, and industrial raw materials to manufacture's prices are tested by means of a nonparametric test.[11] This method assumes no specific form of relationship(s) between the variables. The method consists of ranking each observation and replacing the observation series by the "rank" series; then the coefficient of disarray "t", defined below, is computed:

$$t = \frac{2S}{N(N-1)}$$

where N is the number of observations and S the total score. S is computed from the number of positive scores P, using the relationship:

$$S = 2P - (1/2)(N)(N-1)$$

The positive scores P are computed as follows: Consider first the rank of the first element. Then count the number of ranks (r_1) of the remaining N-1 elements of the series larger than that of the first element. Again, take the rank of second element, and count the number of ranks (r_2) of

[11] Mann, H. B. Non-parametric tests against trends. Econometrica 13: 246 pp. 1945; also Tintner, G. Econometrics. John Wiley & Sons, New York. 1952.

the remaining N-2 elements larger than the rank of element 2 and so on. Then P is simply the sum of $r_1 + r_2 + - - - - -$.

Then the ratios of prices are tested for the existence of, and the sign of, trend by means of a test given by Kendall.[12] For N larger than 10, the distribution of S converges to normality with mean zero and variance:

$$\frac{N(N-1)(2N+5)}{18}$$

The 4 ratios tested by this method are those of prices of agricultural commodities to manufactures' prices, of food articles and food grains to manufactures' prices, and of industrial raw materials to manufactures' prices.

The ratios of index of wholesale prices of agricultural commodities to manufactures' prices for the period 1950–51 to 1965–66 are given in table 21. The computations indicate that the value of the positive score P is 65, the total score S = 42, and the Kendall's rank correlation coefficient is .087.

Table 21. **Relative prices, 1950–51 to 1965–66**
(1952-53 = 100)

Year	Food articles to manufactures	Agricultural commodities to manufactures	Food grains to manufactures	Industrial raw materials to manufactures
1950–51	108 9	116 2	91.2	126.7
1951–52	93 4	99 6	85.3	118.4
1952–53	100 0	100.0	100.0	100.0
1953–54	99.5	105 0	96 0	106 8
1954–55	94.9	94 6	75.9	102.2
1955–56	86.9	88.3	73.3	99.3
1956–57	96.2	98.3	88.0	109.1
1957–58	98 4	97.4	90.1	107.8
1958–59	106.3	105.2	98.1	106.6
1959–60	106.5	104.3	91.6	110.7
1960–61	96.9	100.0	82.6	117.4
1961–62	94.9	97 0	79 3	112.6
1962–63	97.9	95.7	81.9	106.0
1963–64	104.3	99.7	88.6	108.3
1964–65	116.5	113.2	105.0	124.1
1965–66	110.7	113.6	101.0	137.7

Sources: (1) See footnote 5, p 8.
(2) Government of India, Ministry of Finance, Budget for 1964–65, New Delhi, p. 255.
(3) Reserve Bank of India. Report on currency and finance, S21, S22. Bombay. 1964–65.
Reserve Bank of India Report on currency and finance, Statement 18. Bombay. 1958–59.

[12]Kendall, M. G. Rank correlation methods, p. 141. London. 1948.

The conclusion is that the terms of trade between agricultural commodities and manufactures have moved slightly in favor of the agricultural sector. This also agrees with the analysis in table 20, when agricultural commodities had a trend value higher than that of manufactures.

Based on table 21, the trend line of prices of food articles in relation to manufactures' prices is:

$$p^{fa}/p^{m} = 95.15 + \underset{(0.385)}{0.661}\ t$$

where p^{fa} are the prices of food articles.

The regression coefficient is not statistically significant at the 5 percent level of significance, showing that the terms of trade were not favorable to either at this specific level but moved in favor of food articles at the 10 percent of probability level.

On the basis of the nonparametric test the value of the positive score P is 76, the total score S = 32, and the rank correlation coefficient is +0.267. The conclusion from this test corroborates the above results from regression method that the terms of trade have moved slightly in favor of food articles at about the 10 percent level of significance.

The trend line fitted to the ratio of the prices of food grains to those of manufactures gives the following relationship:

$$p^{f}/p^{m} = 86.25 + \underset{(0.511)}{0.353}\ t$$

where p^{f} is the index of food-grains prices. The trend coefficient is not significant, implying that there was no definite trend in the ratio of prices of food grains to those of manufactures. The terms of trade thus consist of simple fluctuations during the period under reference.

The calculations regarding the nonparametric test show the positive score P to be equal to 66, the total score S = 12, and the rank correlation coefficient as +0.1. The conclusion from this test is that the terms of trade have moved slightly in favor of food grains. Our earlier trend analysis of table 20 showed that food-grains prices rose at a slightly higher rate than did the prices of manufactures. It may thus be concluded that the terms of trade between food grains and manufactures have had large fluctuations with modest trend value in favor of food grains.

The equation of the trend line for the price ratio of industrial raw materials to manufactures is as follows:

$$p^{ir}/p^{m} = 105.98 + \underset{(0.552)}{0.721}\ t$$

where p^{ir} are the prices of industrial raw materials. The trend is significant at a probability level lower than that of 5 percent. The nonparametric test calculations give the value of positive score P as 74, the total score as 28, and the rank correlation coefficient as 0.233. The conclusion from this analysis is that there is a trend between prices of industrial raw materials and those of manufactured goods. The terms of

trade have been favorable to the industrial raw materials in comparison to manufactures. This conclusion is consistent with our analysis in table 20, which indicated a higher trend value for industrial raw materials than for manufactures.

Thus, the terms of trade have moved in favor of food articles and food grains, and against manufactures. Likewise, the terms of trade moved toward industrial raw materials in relation to manufactures.

Increased incomes in the agricultural sector can benefit the capital formation in the industrial sector if the agriculturists save more and transfer these funds to the industrial sector in the form of direct investments. Alternatively, the transfer of capital from the agricultural sector to the industrial sector could be affected by increased taxation in the agricultural sector and by using these revenues to form industrial capital. As mentioned earlier, no data are available on direct investments by agriculturists. These are small anyway, and the taxation has been rather mild for agriculture as compared to industry (see section on taxes); it is therefore concluded that there has not been a significant transfer of capital from agriculture to the industrial sector.

Chapter IV. Direct Influences of Agricultural Production on Industrial Capital Formation

The various facets of direct influences of agriculture on industrial capital formation studied here are (1) the significance of wages and industrial raw materials, particularly those from agriculture, in the industrial cost structure; (2) the role of food and food grains in the budgets of wage earners; and (3) the effects of agricultural production and price changes on farm incomes and the demand for industrial products and their prices.

Wages and Raw Materials in the Industrial Cost Structure

The cost structure of industries has been discussed separately for the private sector and the public sector. The total cost of production is split into costs relating to raw materials, wages, salaries, and benefits to employees, and other expenses, which include the purchase of finished and semi-finished products, stores and spare parts, power and fuel, maintenance, and miscellaneous items.

Private industrial sector

The percentage shares of raw materials and wages and salaries in the total production expenses vary considerably from one industry group to

Table 22. **Percentage shares of raw materials and wages and salaries in the industrial cost structure, private organised sector, 1960-61 to 1964-65**

Year	1 Agriculture and allied activities	2 Mining and quarrying	3 Processing & manufactures (foodstuffs, textiles, leather, and products thereof)	4 Processing & manufactures (metals chemicals, and products thereof)	5 Processing & manufactures (not elsewhere classified)	6 Other industries	Total
Raw materials:							
1960-61	25	25	56	52	34	78	54
1961-62	25	24	54	51	33	76	53
1962-63	27	24	52	51	33	76	52
1963-64	29	24	49	50	33	76	51
1964-65	28	24	53	50	34	77	52
Wages, salaries and bonus, etc.:							
1960-61	41	51	17	16	12	10	16
1961-62	39	50	16	16	12	10	16
1962-63	38	50	16	16	13	10	16
1963-64	35	51	16	16	12	10	15
1964-65	38	50	17	15	13	10	16

Sources: (1) See footnote 5, p. 8, Bawa. U. S., Appendices 5.1 and 5.2.
(2) Reserve Bank of India Bul., Nov. 1966.

another; but by and large they have been steady over the 5-year period 1960–61 to 1964–65. Wages and salaries are only one-third as important as raw materials in the organized industrial sector (table 22). These 2 components together form the bulk of total expenditure.

Industrial raw materials from agriculture were fed primarily to (i) processing and manufacture — foodstuffs, textiles, leather and products thereof — and to (ii) agriculture and allied activities. The latter (ii) include essentially plantation crops, whereas the supply of all kinds of fibers, jute, cotton, etc., oilseeds and leather from skins and hides, etc. is consumed by the former (i). The size of the industry group (ii) in terms of paid-up capital in relation to the other agriculturally based industries (group 3, table 22) was so slender that the behavior of industry group 3 was overwhelmingly dominant over the behavior of the former. The cost structure of the industry group, therefore, was designated to represent all agriculturally based industrial activities. According to this, the raw materials from agriculture form nearly 50 per cent of the total expenditure on production, as compared to some 16 percent toward salaries and wages — just about the same conclusion as was obtained above in respect to the entire private industrial organized sector.

This analysis is in line with the conclusion that just as all raw materials are predominantly important in relation to wages and salaries in the cost structure of the entire organized industries sector, they are equally important in the agriculturally based industries as well in relation to wages and salaries

Public industrial sector

The consumption of raw materials in the public industrial sector projects did not have a set pattern during the 5 years under consideration, particularly for the steel industry (table 23). This was due to the fact that the 3 steel mills were at different stages of production each year and required raw materials in different proportions. The share of raw materials in the total cost of production in the steel industry was contrastingly higher than that for industrial projects other than steel On the other hand, wages and salaries were fairly steady for the various steel projects, as well as over the years. Raw materials were a more important item of cost for steel mills, while wages and salaries were more important for other industrial projects. In general, raw materials accounted for nearly 20 percent of the total cost in the public sector projects, and wages and salaries accounted for nearly 15 percent. Our conclusion, therefore, is that raw materials, in relation to wages and salaries, although not as important as in the private industrial sector, are still a substantial item of expenditure in the public sector industrial cost structure.

Table 23. **Percentage shares of raw materials and wages and salaries in public sector industrial undertakings, 1960–61 to 1964–65**

Year	Steels	Rourkela	Bhillai	Durgapur	Other than Hindustan steels	Total
Raw materials:						
1960–61	38	NA†	NA†	NA†	58*	52
1961–62	34	25	35	38	13	19
1962–63	30	24	26	33	16	21
1963–64	27	21	27	30	16	20
1964–65	25	23	26	28	16	19
Wages and salaries, etc.:						
1960–61	16	NA†	NA†	NA†	19	18
1961–62	12	13	11	9	16	15
1962–63	10	11	10	10	16	14
1963–64	10	10	10	9	16	14
1964–65	11	10	10	11	15	13

*Includes stores, etc.

†Not available.

Sources: (1) See footnote 5, p. 8, Bawa, U. S., Appendix 5.3.

(2) Government of India, Bur. Pub. Enterpr., Dept. of Cab. Affairs. Ann. Repts. Indus. and Commerc. Undertakings, 1960–61 through 1965–66. New Delhi.

Structural Patterns of Consumption

Itemized data on the budgets of urban and rural wage earners have been studied to investigate the importance of food and food grains in the overall cost structure via wages and salaries. The data on the consumption expenditure by different expenditure classes in the rural and urban areas have been collected by the National Sample Survey (N.S.S.) on an extensive sample basis, while those for the industrial workers alone have been collected by the Labor Bureau, Ministry of Labor, at some of the important industrial centers.

National Sample Survey data on urban and rural consumption expenditure

The National Sample Survey (N.S.S.) is a multipurpose national survey in which data are collected on a large number of items. Surveys on consumption expenditure in the urban and rural areas were included in their rounds 2 to 7 for the period April 1951 to March 1954; round 8, July 1954 to March 1955; round 9, May to November 1955; round 10,

December 1955 to May 1956; rounds 11 and 12, August 1956 to August 1957; and round 13, September 1957 to May 1958. Since our interest lies only in the pattern of expenditure, we have considered data from N.S.S. round 13 as the latest available survey.

Consumer expenditure comprises all domestic household spending, including consumption out of home-grown produce, gifts, loans, etc. The expenditure for household enterprises is excluded from the consumer expenditure. Consumption of home-grown produce is evaluated at ex-farm prices, and does not, therefore, include transport and other distributive service charges that a retailer normally includes in his selling price. Consumption of gifts and charities or articles acquired through barter exchanges are evaluated at prevailing retail prices. Although consumption of transfer receipts is included, transfer payments of all kinds (loans, gifts, charities, monetary as well as in kind) are excluded. Purchase and construction of residential houses are considered as expenses on capital account and hence are excluded from the consumer expenditure, but the expenditure toward maintenance of residential building is included as a part of the consumer expenditure.[13]

Expenditure on food items comprises a little over two-thirds of the total expenditure in the rural areas; the highest proportion of 81 percent is in the lowest expenditure class and the lowest of 46 percent is in the highest expenditure class (table 24). Food items comprise 77 percent of total expenditure of the large landless-labor class.[14] Food grains accounted for 60 percent of total food budget of the rural households. As the monthly expenditure increases, the percentages of the total expenditure spent on food grains and all food items continually decreases.

As in the rural areas, food items in the urban areas account for the major portion (nearly 60 percent) of the total consumption expenditure; the highest and the lowest proportions are 78 and 44 percent respectively. Food grains form only 41 percent of the total food budget, as against 60 percent in the rural areas; the range for the lowest to highest expenditure classes is 67 percent and 22 percent. As in the rural areas, the percentage of total consumption expenditure on food grains and on total food in urban areas continues to decline as the expenditure level increases.

Comparing the rural-urban patterns of consumption, the disparity in consumption of food grains as a percentage of total expenditure in rural and urban areas keeps widening with the rising expenditure classes. In the lowest expenditure class, the rural consumer spent 17 percent more on his food-grains consumption than his urban counterpart whereas in the highest expenditure class, this difference increased to 80 percent more for the rural consumer than the urban consumer. This is in line with the

[13] Government of India, Cabinet Sec. National sample survey report 80 (Tables with Notes on Consumer Expenditure), p. 3. Delhi. 1963.

[14] See footnote 13.

Table 24. **Percentage distribution of consumption expenditure in rural and urban areas by expenditure classes, September 1957 to May 1958**

Monthly per capita expenditure class (Rs.)	Food grains				Total food				Total nonfood		
	R	U	(R−U)*	R+U	R	U	(R−U)*	R+U	R	U	R+U
	percent										
0– 8	61	52	17	60	81	78	3	80	19	23	20
8–11	59	47	26	57	80	77	4	80	20	23	20
11–13	53	45	18	52	77	75	3	77	23	25	23
13–15	50	42	19	49	76	73	4	76	24	27	24
15–18	47	37	27	46	74	70	6	74	26	30	26
18–21	45	32	41	42	74	68	9	73	26	33	27
21–24	41	29	41	39	70	66	6	69	30	34	31
24–28	37	27	37	35	67	65	3	66	33	36	34
28–34	35	25	40	33	64	62	3	63	36	38	37
34–43	30	20	50	28	61	58	5	60	39	42	40
43–55	26	16	63	22	57	55	4	56	43	45	44
55 and above	18	10	80	15	46	44	5	45	54	56	55
All classes	41	25	64	37	68	60	13	66	32	40	34

*Represents (R-U/U x 100), the excess of rural over urban in terms of percentage.

Sources: (1) See footnote 5, p. 8, Bawa, U. S., Appendices 5.4 to 5.7.

(2) Government of India, Cabinet Secretariat. Natl. Sample Surv. Rpt. 80 (Tables with notes on consumer expenditure), p. 3. Delhi. 1963.

general observation that the lowest expenditure classes in rural and urban areas have not much choice or ability to substitute for food grains.

The category "total food" does not show wide disparities between rural and urban consumption The rural consumer allocates only 3 percent more of his total expenditure on total food than an urban consumer in the lowest 3 expenditure classes. This percentage gradually increases to 9 percent for the class Rs. 18–21 and again declines to 3 percent for higher expenditure classes

In table 25 industries are classified in terms of low, medium, and high earnings per worker, and the consumption patterns of these classes assumed to correspond to the urban monthly expenditure classes Rs. 0–8 to Rs. 15–18, Rs. 18–21 to Rs 34–43, and Rs 43–55 and above, respectively. The "low earnings per worker" class contains industries such as wood and cork (except furniture), furniture and fixtures, paper and paper products, leather and leather products (except footwear), nonmetallic minerals products (except petroleum and coal), water and sanitary services, and the personal services The "medium earnings per worker" class comprises industries such as textiles, footwear, other wearing apparels and made-up textile goods, printing, publishing and allied industries, rubber and rubber products, chemicals and chemical products, metal products, machinery (electrical and mechanical), transport equipment, and recreation industries The "high earnings per worker" class includes industries such as products of petroleum and coal, basic metal industries, and electricity, gas, and steam The purpose of reclassifying these industries as envisaged above is to show the substantial variability in the consumption pattern of workers within the industrial complex.

Consumption of food grains in the total consumption expenditure of factory workers changes sharply from one earnings class to another (table

Table 25. **Consumption patterns of industrial workers, by earnings per worker, for a 30-day period, 1957–58**

	Low earnings (Rs. 0–8)	Medium earnings (Rs 15–18 to 18–21)	High earnings (Rs 34–43 to 43–55)
	rupees/week		
Food grains	5.22 (42.0)	6.97 (25 8)	7 77 (11.4)
Total food	9.11 (73.3)	17 00 (63.0)	31 95 (47.0)
Total nonfood	3.32 (26.7)	9.99 (37.0)	3 .97 (53.0)
Total food and nonfood	12.43	26 99	67.92

Figures within parentheses indicate percentages

Sources: (1) See footnote 5, p. 8, Bava, U. S., Appendices 5.6 and 5.7.

(2) Government of India, Cabinet Secretariat. Natl. Sample Surv. Rpt. 80, p. 135. 1963.

25). The low-earnings class spends 42 percent of their budgeted expenditure on food grains while the high-earnings class spends only 11 percent. The consumption pattern changes more from food grains towards other foods, rather than toward nonfood items as the earnings per worker increase. Total food accounts for nearly three-fourths of the total in the low-earnings class, as against less than one-half in the high-earnings class. The decline from the low- to the high-earnings classes in expenditure on the component food grains as a percentage of total food is relatively smaller than the gain in percentage expenditures on nonfood items in these earnings classes.

Consumption pattern of industrial workers at seven important centers

The Labor Bureau, Ministry of Labor and Employment, Government of India, during the Second Five Year Plan period, organized family living surveys at 50 important factory, mining, and plantation centers. Published reports are available for 7 industrial centers at Hyderabad, Bhavnagar, Alleppey, Digboi, Madras, Bangalore, and Sambalpur. The data relate to the working-class families. At the 7 centers included here, 55.1 thousand families were surveyed to obtain estimates of their consumption expenditure and its pattern. The industries covered at different industrial centers are listed below. Apparently the representation has been cross-sectional and fairly widespread, in terms of industries as well as of regions. Therefore, this sample seems to adequately represent workers in the Indian industries.

Industrial center	Industries covered
Alleppey	Manufacture of Coir and Coir products.
Hyderabad	Edible fats and oils; manufacture of cigarettes; cotton spinning and weaving in mills; manufacture of drugs and medicines; cosmetic and other toilet preparations; nonmetallic mineral products other than petroleum and coal; manufacture and assembling of machinery and motor vehicles except motor engines; printing and publishing
Bhavnagar	Manufacture of iron and steel; production of hydrogenated oil; cotton spinning and weaving in mills.
Bangalore	Cotton spinning and weaving in mills; weaving silk textiles by power looms; manufacture of electronic and electrical equipment; manufacture and repair of air transport equipment; construction and maintenance of buildings.
Madras	Manufacture of coal and coal products and of basic metals and their products; manufacture of machinery (all kinds other than transport), electrical equipment, and transport equipment; production of motion pictures; and cotton spinning and weaving in mills.

(continued)

Table 26. **Monthly consumption expenditure per family of industrial workers at important centers, 1958–59**

	Hyderabad		Bhavnagar		Alleppey		Digboi		Madras		Bangalore		Sambalpur		Overall	
	rs.‡	%	rs.	%	rs.	%	rs.	%	rs.	%	rs.	%	rs.	%	rs.	%
1. Cereals, pulses, and products	42 58	31	40 04	27	30.51	32	44 83	26	38.58	26	42.71	30	28.57	38	40.97	29
2. Milk and milk products	4.72	4	14 51	10	2.16	2	9.50	6	5 49	4	8 51	6	0 50	1	7.55	5
3. Edible oils	4 04	3	7.04	5	0.95	1	8 19	5	3 93	3	3 34	2	1.66	2	4.42	3
4. Meat, eggs, and fish	4.99	4	2 07	1	4.31	4	13.93	8	6 70	5	5 55	4	2 63	4	5 17	4
5. Sugar, etc.	2 40	2	6 88	5	2.51	3	5.17	3	2 31	1	3 47	2	0.67	1	3.58	2
6. Pan, supari, tobacco, and alcoholic beverages	8 19	6	7 58	5	3 46	3	8 62	5	3 34	2	5 31	4	7.55	10	6.57	5
7. Other food*	19 57	14	20 03	13	18 67	20	20 82	12	26 73	18	18 38	13	9.01	12	20.13	15
Subtotal (food)	86 49	64	98 15	66	62 57	65	111.06	65	87.08	59	87.27	61	50 59	68	88.39	63
8. Clothing, bedding, footwear and headwear, etc	13 23	10	16.56	11	7.49	8	18 63	11	13 45	9	16.06	11	5.67	8	14.40	10
9. Fuel and light	6.45	5	8 34	6	4.58	5	11.40	7	8 56	6	10.73	7	5.01	7	8.18	6
10 Rent for house, water charges	10 93	8	9.53	6	6.40	7	14.49	8	13 26	9	13 28	9	6 46	9	11 39	8
11 Personal care†	17.67	13	16 26	11	14 90	15	14 56	9	24 68	17	16 86	12	5 49	8	17.55	13
Subtotal (nonfood)	48 28	36	50.69	34	33.37	35	59 08	35	59 35	41	56 93	39	22.63	32	51.52	37
Total	134 77	100	148 84	100	95 94	100	170.14	100	146.43	100	144 20	100	73.22	100	139.91	100
No. of families (000)	19.1		10.1		3.0		2 7		6 6		13 0		0.6		55.1	

*Includes fruits, vegetables and products, condiments, spices, nonalcoholic beverages, and prepared meats.
†Includes education, reading, recreation and amusement, medical care, and other consumption expenditure.
Source: Government of India, Labor Bur., Minis Labor and Employment. Report on family living survey among industrial workers, 1958-59 at important industrial centers. New Delhi, 1965.
‡rs = rupees

Digboi	Production of petroleum, kerosene, and other petroleum products; collection, purification and distribution of water for domestic and industrial consumption.
Sambalpur	Production of cereal crops (including Bengal gram) such as rice, wheat; manufacture of bidi, fertilizers, paper bags, boxes, envelopes, cards, etc

For these 7 centers, consumption expenditure per family averaged about 140 rupees per month, with the lowest 96, at Sambalpur, and the highest, 170 per month, at Digboi (table 16). Since the representation of these 2 centers in terms of working-class families was relatively small, they did not significantly affect the overall average. Food accounted for the largest single expenditure; this has been almost constant at about 60 percent of total expenditure at all the centers.

With wages and salaries comprising only about 15 percent of industrial costs, food costs carry a derived weight of only 9 percent in industrial cost structures. This considerably weakens the wages–good argument concerning industrial capital formation. However, for certain industries, wages and salaries comprise a much higher percentage of total cost and food expenditure a higher proportion of consumer expenditures.

Effects of Production and Price Changes on Farm Incomes and the Demand for Industrial Products

This section deals with the effects of agricultural production and price changes on (i) agricultural incomes, and (ii) the demand for industrial products and, implicit in it, the prices of industrial products.

Agricultural income has a direct relation to agricultural output and prices. The higher the output or prices, the higher is the income. The rate of increase in agricultural income is the sum of the rates of increase in agricultural output and agricultural prices, net of the rate of change in material inputs The rate of change in material inputs can be assumed to be small. Therefore the effect of agricultural production per capita and agricultural prices on per capita farm incomes can be expressed by the following linear relationship:

$$(1) \qquad Y^a/P = c_0 + c_1 X^a/P + c_2 p^a$$

where Y^a = agricultural income

X^a = agricultural production, and

p^a = index of agricultural prices

P = population

and Y^a/P is the dependent variable while X^a/P and p^a are predetermined variables for this relationship.

The demand for industrial products as a result of changes in agri-

cultural production and prices can be translated into 2 phases. In the first, we determine the effect of agricultural income on the demand for industrial products; in the second, we take from the above relation (1) the change in agricultural income as a result of change in agricultural production. The interaction of these 2 phases gives an estimate of the change in demand for industrial products resulting from changes in agricultural production.

The index of industrial production represents quantity demanded, assuming an equilibrium situation of demand and supply. The quantity of industrial products demanded, X^I_d, depends upon their own prices, p^m. Industrial outputs are consumed by agricultural and nonagricultural sectors. The demand for industrial products by the agricultural sector depends upon prices it receives for its products, p^a, as against what it pays to purchase industrial products to be used as inputs for agricultural production and consumption purposes. Moreover, this demand by the agricultural and nonagricultural sectors also depends upon the incomes from the respective sectors. The demand relation of the industrial products is thus of the form:

$$X^I_d = f(p^m, p^a, Y^a/P, Y^I/P)$$

where X^I_d = quantity demanded of industrial products, proxied by industrial output.

p^m = prices of industrial products (manufactures)

p^a = prices of agricultural products

Y^a = agricultural income

Y^I = industrial income.

In this relation p^m, p^a and Y^a are deemed to be predetermined, but Y^I cannot be assumed to be so. In fact, X^I explains Y^I, just as Y^I explains X^I. Thus, X^I_d and Y^I are the two endogenous variables. We cannot solve this relationship by single-equation regression analysis without introducing serious statistical bias because of 2 jointly determined variables in the same relationship. We need another relationship expressing Y^I as a dependent variable. The industrial income Y^I depends upon industrial output and on prices of industrial products and industrial raw materials going into production process, giving the following functional relationship:

$$Y^I/P = f(X^I/P, p^m, p^{ir})$$

where $X^I = X^I_d$ = index of industrial production

p^{ir} = prices of industrial raw materials.

The system involving 2 jointly determined variables, X^I and Y^I, can be represented by the following 2 equations:

(2) $$X^I_{d/P} = a_0 + a_1p^m + a_2p^a + a_3Y^a/P + a_4Y^I/P$$

(3) $$Y^I/P = b_0 + b_1p^m + b_2X^I/P + b_3p^{ir}$$

The only new predetermined variable being introduced is the p^{ir}, thus forcing the equation (2) to be just identified. As a result, the estimates of structural coefficients should be the same whether we use, as the computational procedure, the method of instrument variables, 2-stage least squares, or the limited-information technique.

The relationship among agricultural production and prices and farm incomes over the period 1950–51 through 1964–65 is:

$$Y^a/P = 53.17 + \underset{(.048)}{.520}\ X^a/P - \underset{(.022)}{.015}\ p^a \qquad R^2 = .92$$

$$\text{Beta: } .201 \qquad -.003$$

where p^a, Y^a/P and X^a/P are the agricultural prices, per capita agricultural income and per capita agricultural production. The high value of the multiple determination coefficient shows that prices and production explain almost the entire variability of agricultural incomes, thereby supporting the assumption that the material inputs used in the process of agricultural production are negligible. The coefficients of partial regression of farm income on production are significant, showing thereby that there is a meaningful and important variable to explain farm income. The relative importance of prices and production is shown by the beta coefficients, which indicate that production is much more important than prices in explaining farm incomes. Consequently, agricultural income is more elastic with respect to agricultural production than it is with respect to agricultural prices. At the mean values, the partial elasticity of farm income with respect to agricultural production is 0.53; and the partial elasticity of farm income with respect to agricultural prices is only 0.02.

Agricultural prices affect agricultural income less than they affect agricultural production for the following reasons: First, prices affect income only in proportion to the marketable surplus, which is a small portion of the total output. Therefore in an economy in which a high proportion of production is consumed in the homes at the farm level, prices have little relevance to the generation of real income. If prices change by 10 percent and if only about one-third of what is produced is marketed, the price change will have only about a 3 percent effect on real income. Taking the average marketing percentage for food grains in India, the dilution is about 2 to 1.

Second, normally when prices go up, production has gone down, and vice versa. Thus there will rarely be a large change in income accompanying price changes. Usually, a production change is accompanied by a counter price change, and change in revenue depends on the price elasticity of demand.

To compute the demand for industrial products as a result of a change in agricultural production, we proceed as follows:

$$\frac{d(X^1/P)}{d(X^*/P)} = \frac{d(X^1/P)}{d(Y^*/P)} \cdot \frac{d(Y^*P)}{d(X^*/P)}$$

the estimation of $\frac{d(X^1/P)}{d(Y^*/P)}$ from (2) and (3) above has been done as phase 1 in three steps, and $\frac{d(Y^*/P)}{d(X^*/P)}$ is estimated from (1) as phase 2.

Phase 1:

(i) Estimate (X^1/P) by the ordinary least squares (OLS) method from (2):

$$(4)\quad X^1/P = -82.80 - \underset{(.162)}{.164}\, p^* + \underset{(.280)}{.513}\, p^m - \underset{(.421)}{.333}\, Y^*/P + \underset{(.204)}{1.715}\, Y^1/P$$

Y^1/P being a jointly dependent variable but estimated from observed data.

(ii) Estimate the reduced form for Y^1/P, again by OLS:

$$(5)\quad Y^1/P = -98.23 + \underset{(.297)}{.278}\, p^* - \underset{(.304)}{.587}\, p^{tr} + \underset{(.332)}{1.314}\, p^m + \underset{(.459)}{1.024}\, Y^*/P$$

(iii) Again, estimate X^1/P using the computed (estimated) value of Y^1/p from (5) above:

$$(6)\quad X^1/P = -16.21 - \underset{(.356)}{.089}\, p^* - \underset{(.897)}{.069}\, p^m + \underset{(1.264)}{1.104}\, Y^*/P + \underset{(.835)}{2.335}\, Y^1/p$$

There are 2 estimates of $\frac{d(X^1/P)}{d(Y^*/P)}$ one from (4) by the ordinary least squares (OLS) and the other from (6) by the method of 2-stage least squares (2SLS); the standard errors in the latter are much higher. The parameters and their standard errors have asymptotic distributions under the 2SLS. In fact very little is known about statistical tests using the 2SLS[13] method. But we are interested only in the parametric values, not in their standard errors, and the parameters have similar values under both OLS and 2SLS. The choice could fall on either set of coefficients, but the presence of simultaneity between X^1 and Y^1 rules out the OLS estimates. Since OLS in the presence of 2 jointly determined variables gives biased and inconsistent estimates of structural coefficients, we have chosen the set of structural coefficients given by the estimation procedure in which both the endogenous variables have been simultaneously taken into consideration.

$$\frac{d(X^1/P)}{d(Y^*/P)} = +1.104$$

[13]Christ, C. F. Econometric models and methods, p. 515. John Wiley & Sons, New York. 1966.

The positive sign of this coefficient in (6) is justifiable on the ground that an increase in Y^a implies, among other things, an increase in X^a, which, in turn, implies an increase in the demand for industrial products used in agriculture.

Phase 2:

From the estimation of (1) we get

$$\frac{d(Y^a/P)}{d(X^a/P)} = +.520$$

Combining phases (1) and (2), we get

$$\frac{d(Y^a/P)}{d(X^a/P)} \cdot \frac{d(Y^a/P)}{d(X^a/P)} = +1.104 \times .520 = +.574$$

The point elasticity of demand for industrial products in response to agricultural production at the mean values is:

$$E_{X^I/P,\, X^a/P} = \frac{d(X^I/P)}{d(X^a/P)} \cdot \frac{\bar{X}^a}{\bar{X}^I} = .574 \times \frac{111.6}{128.50} = .50$$

Thus

(1) For a 10 percent change in agricultural production the farm income changed by 7.5 percent;

(2) For a 10 percent change in agricultural prices, the agricultural income changed by only 0.5 percent, showing that the effect of prices on agricultural income was far less than the effect of agricultural production; and

(3) For a 10 percent change in agricultural production, the demand for industrial products changed by 5 percent.

This analysis is significant in a number of respects. It suggests that agricultural price increases were, in general, highly deleterious to development because it had very little, if any, effect on the demand for food and also some very significant effects on the capital formation of the industrial sector from the side of cost structure (see chapter VI, same conclusion about prices of food grains). An increase in the price of agricultural commodities including raw materials, thereby raising the cost of production and pushing the prices of industrial products, was a deterrent to increased demand for industrial products. Higher industrial incomes, however, helped to increase the demand for industrial products.

Chapter V. Indirect Influences of Agricultural Production on Industrial Capital Formation

The preceding chapter dealt with the direct effects of agricultural production on industrial capital formation. This chapter is chiefly concerned with the indirect influences of farm production on capital formation in the industrial sector. Direct and indirect effects need not operate either in watertight compartments or one at a time. The important indirect influences of agriculture on industrial capital formation operate through the government revenue accounts, which have relationships with credit, wage, and tax policies of the government. The hypotheses that can be tested for the "indirect influences" are whether (i) the government plays an important role in the capital formation of the industrial sector and (ii) prices of food grains are important to government revenue accounts.

Government Capital Expenditure and Food-Grains Prices

The relationship between government capital formation and price movements in the agricultural sector can be traced by means of a set of simple relations. There are 2 alternative paths for the government investment function, one as a result of the squeeze on government expenditure affecting wages and salaries and through them agricultural prices, and the other due to tax increases following a squeeze on government receipts. These 2 sets of relationships are:

(i) $W^g = f(p^f, N^g)$

$E^g = f(W^g, I^g)$

$I^g = f(R, E^g, B^g)$

and (ii) $R = f(T)$

$I^g = f(R, E^g, B^g)$

where W^g = wages and salaries in the government sector (Center and States)

p^f = prices of food grains

N^g = employment in the government sector

E^g = government spending

I^g = capital expenditure in the government sector

R = revenue on current account

B^g = government borrowings (internal and external)

T = tax receipts in the government sector from direct and indirect taxes.

The explanations for the sets of relationships (i) and (ii) are as follows:

(i) An increase in agricultural prices, particularly those of food articles, which is an important component of the budgets of government employees, will influence a corresponding increase in the demand for higher wages, affecting the wages-and-salaries part of the total government expenditure, as well as the government spending due to increases in costs. Assuming no change in the existing tax system and the current level of receipts on revenue account, with increased spending the net revenue account will show a decline. A decreased revenue account will necessitate a squeeze on credit to the government sector. An action contrary to this will bring enhanced spending, however, into the hands of the investors and consumers, raise further the prices of food articles and other agricultural commodities, and again the above cycle will come into motion. The major sources of supply of investible funds in the public sector are the government borrowings and the surpluses of public undertakings. With squeezed borrowings, the capital formation in the government sector will be adversely affected if the surpluses of the public projects do not compensate for this squeeze.

(ii) If the government revenue account decreases, assuming no change in government expenditure, the receipts go down, necessitating higher taxes. In other words, the low level of taxes was responsible for lower government receipts which, in turn, will squeeze the revenue account. The rest of the chain of events explaining government investments remains the same as in (i) In the ultimate analysis, we can determine the influence of taxation on government capital formation. A squeeze in revenue account will mean a certain level of deficit financing. This, as pointed out earlier, comprises increases in money supply and/or increases in government borrowings. The change in money supply is the sum of the changes in real output, income velocity of money (ratio of money national income to the stock of money each year), and pure inflationary change. The income velocity of money, as estimated by Johri[18] appears to have remained neutral during 1956–57 to 1960–61 In either case, whether the money supply increases or government borrowings increase, there is expected to be a positive influence on investments in the government industrial sector because of its substantially low industrial profits as a source of financing its investments.

A squeeze in borrowings will affect industrial investment in the private sector. Revenue account plays its own part through direct taxes. The chain of events explaining private investments by means of changes in direct taxes is set out in the following relations:

(iii) $W^{pr} = f(p^r, N^{pr})$

(continued)

[18]Johri, C. K. Monetary Policy in Development Economy, p. 28. World Press, Calcutta. 1965.

$$\pi^{pr} = f(T^d, W^{pr}, W^{pr}, R^m, Y^{pr})$$

$$I^{pr} = f(\pi^{pr}, B^{pr}, X^{pr}_{-1})$$

where W^{pr} = wages, salaries, and other benefits to employees in the organized industrial sector (total wage bill)

p^f = index of wholesale prices of food grains (1952-53 = 100)

N^{pr} = index of employment in the manufacturing sector

π^{pr} = industrial profits (retained profits + depreciation provision)

T^d = direct taxes (Center and States)

R^m = value of raw materials consumed

Y^{pr} = gross income from sales and 'other income'

I^{pr} = investment in the organized industrial sector

B^{pr} = borrowing in the private industrial sector

X^{pr} = index of industrial production

The explanation of this relationship is that a change in direct taxes, along with cost components on account of wages and raw materials, will affect the profits of the private industrial sector. Profits along with borrowings are the sources of investible funds. A squeeze in credit availability will influence industrial investment in the private sector. If the supply of investible funds by means of profits overshadows the squeeze in the credit, the credit squeeze may not have any influence on the industrial capital formation. On the other hand, if the "profits" are a weak variable in terms of their contribution to the total supply of funds, credit squeeze will dampen the investments. In the ultimate analysis, it will be possible to express investment in the private sector, I^{pr}, as a function of direct taxes; in other words, how do the direct taxes affect the status of capital formation in the private sector? The effect of direct taxes on the private sector, as a result of the squeeze in profits, will act as a deterrent to industrial investments.

The Statistical Model and Its Analysis

The effect of prices of food grains on government capital expenditure has been formulated in the economic model above. The wages and salaries bill, the total spending, and the capital expenditure in the government sector have been classified as the 3 endogenous variables; the remaining 4 variables — prices of food grains, government employment, revenues on revenue account, and government borrowings — have been assumed as exogenously given.

The system is closed and complete with 3 jointly determined variables and 3 equations, as follows:

$$W^e = b_{10} + b_{11}\, p' + b_{12}\, N^e + v_1$$

$$E^e = b_{20} + b_{21}\, W^e + b_{22}\, I^e + v_2$$

$$I^e = b_{30} + b_{31}\, R + b_{32}\, E^e + b_{33}\, B^e + v_3$$

where the symbols used for variables have been explained in the preceding pages, and v_1, v_2, and v_3 are the random disturbances unaccounted for by the existing explanatory variables.

The system generated by these 3 equations, when put to test for identification purposes, shows that each equation is overidentified and would therefore not be subject to the method of single-equation least squares for a solution. With the assumption of linearity, the disturbances in the system can be presented as follows:

$$v_1 = W^e - b_{10} - b_{11}\, p' - b_{12}\, N^e$$

$$v_2 = E^e - b_{20} - b_{21}\, W^e - b_{22}\, I^e$$

and $$v_3 = I^e - b_{30} - b_{31}\, R - b_{32}\, E^e - b_{33}\, B^e$$

By the conventional criteria of identification each equation is overidentified. Consequently, the system has been solved by means of 2-stage least squares.

Method of two stage least squares (2SLS) or TSLS)

The endogenous variables in a structural equation are not independent of the error term of the equation. The 2-stage least squares method is based on reducing the correlation between the error term and the endogenous variables expressed as explanatory variables. "The idea is to 'purge' the explanatory variables of the stochastic component associated with the disturbance terms."[17] The structural form gives the interactions of the different variables in the system. To study the explicit dependence of the endogenous variables on the predetermined and exogenous variables and the error disturbances, the structural form is solved for the jointly dependent variables to get the reduced form. This is attempted by taking the least-squares regressions of the dependent variables on all the predetermined and exogenously given explanatory variables. This is the first stage when all the reduced form equations are obtained. Reduced form has the basic characteristic that the original system has been solved to express the current values of the endogenous variables as functions of all the predetermined and exogenous variables of the system.

Again, the reduced forms will also be obtained from the structural relationships to be estimated as the second step of the method of 2SLS. If the equations in this system were just identified, the reduced-form equations obtained by both methods would give identical results. But the system under consideration here is overidentified, and we expect different

[17] Johnston, J. Econometric methods, p. 236. McGraw Hill, New York.

reduced forms under these 2 methods. Furthermore, if the interest centers around forecasting alone, the reduced forms given by ordinary least squares and the structure would be relatively less divergent. On the other hand, if the intention is to study certain structural relationships, as it is ours here, reduced forms should be obtained from the structural relationships. Moreover, the coefficients given by reduced forms solved from the structure are statistically more efficient than those given by the "unrestricted" least squares method (direct estimation by OLS).

The second stage of the method is to substitute the computed values of the dependent variables for the observed values where the dependent variables appear in the structural equations as explanatory variables. Then again the transformed structural equations are estimated by least squares. The structural coefficients so estimated are consistent, and the inherent characteristic of such equation-systems is that this method increases multicollinearity (intercorrelation between explanatory variables), and multicollinearity increases the magnitudes of standard errors, which in turn may affect the significance of the structural coefficients. In fact, as has been mentioned by Christ,[18] little is known about the statistical distributions of the 2SLS estimates. The structural coefficients and their standard errors have only approximately normal distributions because (1), the coefficients themselves are only approximately normal and (2) their expectations in general do not exist and so they cannot be unbiased. The standard errors of the structural coefficients are estimators of the approximate (not the exact) standard deviations of these coefficients and the estimates of their variances presumably have the chi-square distribution only approximately at best.

Analysis of the statistical model (i)

As a first step in the statistical analysis by the method of 2-stage least squares, the reduced forms are obtained by the ordinary least squares. These reduced forms and those obtained from the structural equations would give "almost" similar results, if the equations were just identified. Again, as our interest lies in the structure more than in prediction, the reduced forms ought to be obtained from the structural equations (as stage 2) in the 2SLS which are:

Wage equation:

$$W^e = -1.57 + \underset{(.014)}{.101}\, N^e + \underset{(.026)}{.035}\, p'$$

Government spending equation:

$$E^e = 3.57 + \underset{(1.098)}{.397}\, W^e + \underset{(.435)}{.830}\, I^e$$

[18] Christ, C. F. Econometric models and methods. John Wiley & Sons. New York 1966.

Investment equation:

$$I^g = -3.56 + .0050\ B^g - .0029\ R + 1.103\ E^g$$
$$\qquad\qquad\quad (.0051) \qquad (.0040) \qquad (.320)$$

The signs of the coefficients in the above estimated equations conform, more or less, to theoretical considerations. In the "wage equation," the signs of both N^g and p^f are positive, showing that with employment increasing, or p^f increasing, which will push up the wage rates, the wage bill will increase. In the "government expenditure" equation again both the coefficients are positive. This implies that as the wage bill or the capital expenditure goes up, total government spending, holding other components constant, will increase. In the "investment" equation we get positive coefficients both for government borrowings and total spendings, implying that (a) the increased quantum of borrowings, which include internal and external loans and grants (the foreign assistance), will enable the government to increase its capital commitments and (b) increased government spendings, holding other components constant, will increase its capital expenditure. The negative coefficient of R, the revenue on revenue account (i.e., tax and nontax revenues on current account) shows that the increases in current revenues will result in higher civil expenditure, thereby decreasing the capital expenditure. This also substantiates the theory that current revenues help to increase civil administration expenditure, while internal and external loans help to increase the capital build-up and not vice versa. Also, expenditure and revenues, as would be expected, have opposite signs.

In the wage equation, government employment has a statistically significant coefficient at 5 percent level of significance, while the prices of food grains have a coefficient slightly more than its standard error. In the "spending" equation, the variable "capital expenditure" has an almost significant coefficient, and in the "investment" equation, government borrowings have a coefficient equal to its standard error and a significant coefficient for government spending. The coefficients of multiple determination R^2 for these 3 equations are fairly high at .88, .97, and .98 respectively.

The elasticity coefficients are presented in table 27. For a 1 percent increase in food-grains prices (a) total of wages and salaries of the government sector increases by .5 percent through the increases in wage rates; (b) government spending, which includes government revenue expenditure on commodities and services (government administration), government administrative capital expenditure, and government enterprise capital expenditure increase by 1 percent; and (c) the capital expenditure in the public sector increases by 1.5 percent.

As the prices of food grains increase, the salaried class demands higher wages from the government; this raises the cost of government administration expenditure, which in turn puts a squeeze on government revenue

Table 27. **Estimates of elasticity coefficients, model (i) (at the mean values)**

with respect to* \ of*	Government wages & salaries W^g*	Government spending E^g	Government capital expenditure I^g
Government employment (N^g)*	.74*	1.53	2.35
Food-grains' prices (p^f)	.48	.98	1.53
Government borrowings (B^g)	—	1.07	1.79
Revenue on current account (R)	—	2.70	3.74

*For example, .74 = elasticity coefficient of W^g with respect to N^g.

account, revenues having been assumed constant. The total government spending increases and the strain on the current account calls for increased borrowings, which again affect positively the total spending as well as the capital expenditure.

Analysis of statistical model (ii)

Model (i) describe the behavior of the government capital expenditure holding the government revenues as given; model (ii) describes how the capital expenditure is affected by changes in taxes to make good the gap in the revenue account, assuming the government spending as a datum. The latter is a relatively simple model of only 2 equations with 2 jointly dependent variables R, revenues on current account and I^g, the government capital expenditure. Revenues are expected to have a direct relationship with the total taxes, and will in turn explain the I^g.

The 2 variables to be estimated are the government revenues and capital expenditure, whereas the variables exogenously given are the government borrowings, spendings, and taxes (direct and indirect). The system with 2 endogenous variables and 2 equations is complete and a closed one.

$$R = c_{10} + c_{11} T + w_1$$

$$I^g = c_{20} + c_{21} E^g + c_{22} B^g + c_{23} R + w_2$$

where w_1 and w_2 are the disturbance terms not accounted for by the included explanatory variables. These 2 equations are overidentified and would need to be solved by the method of 2-stage least squares. Again, with linearity assumed, the disturbance terms can be presented as follows:

$$w_1 = R - c_{10} - c_{11} T$$

$$w_2 = I^g - c_{20} - c_{21} E^g - c_{22} B^g - c_{23} R.$$

The structural equations obtained from the estimation procedure involving the 2-stage least squares are:

Revenue equation:

$$R = -117.03 + \underset{(.029)}{1.514}\ T$$

Investment equation:

$$I^g = -3.25 + \underset{(.279)}{.686}\ E^g + \underset{(.006)}{.0026}\ B^g + \underset{(.004)}{.0020}\ R$$

Signs of all coefficients in both the equations conform to the theoretical formulation except for that of "current revenues." Increased taxation will increase revenues; similarly, increased total spendings and government borrowings will increase government capital expenditure. As explained above, capital expenditure when approached from the "revenue" side gives a negative coefficient for current revenues R, but with the "expenditure" approach it gives a positive coefficient for R. As a matter of fact, the coefficient of R is not significant statistically, and therefore the sign would not matter too much. The coefficients of tax receipts T and government spending E^g are significant at the conventional level of 5 percent of statistical testing and the "revenue" and "investment" equations explain 99 percent and 97 percent of the total variation in the endogenous variables

The elasticity coefficients so derived from reduced forms from the structural equations are given in table 28. The elasticity coefficients show that a 1 percent change in tax receipts changes the government revenues on current account by about 1 percent and the government capital expenditure by about .3 percent. Again, a 1 percent increase in the total government spending increases the capital expenditure by .95 percent under the assumption that the total spending is exogenously given and the investments are approached by means of "receipts" method.

As the revenue account is squeezed, assuming a given expenditure, the revenue is increased by increasing taxes This increased revenue, along with the "borrowings", forms the supply of investible funds by the government, while total government spendings are the demands on government resources. With an increased supply of resources, the capital expenditure will tend to increase. Again, with increased total expendi-

Table 28. **Estimates of elasticity coefficients, model (ii) (at the mean values)**

with respect to* \ of*	Revenue R*	Government capital expenditure I^g
Tax receipts (T)*	1.08*	.27
Government spending (E^g)		.95
Government borrowings (B^g)		.78

*See footnote to table 27.

ture, the capital expenditure which is a part of total spending will also increase. Therefore, the capital expenditure in this case will be affected from both the supply and the demand of public resources.

Analysis of statistical model (iii)

This section deals with the empiricism of model (iii) set up earlier, showing the effects that direct taxes have on investment in the private organized industrial sector. Direct taxes influence profits, and profits affect the magnitudes of investment. On the other hand, the "wages and salaries" category is affected by the level of employment and the money wage rate. The latter will show up through prices of food grains. Prices of food grains, direct taxes and prices of raw materials consumed influence the gross income and consequently investments in the organized sector.

The above relationships are presented as equations below:

$$W^{or} = d_{10} + d_{11}\, p^f + d_{12}\, N^{or} + w_1$$

$$\pi^{or} = d_{20} + d_{21}\, T^d + d_{22}\, R^m + d_{23}\, Y^{or} + d_{24}\, W^{or} + w_2$$

$$I^{or} = d_{30} + d_{31}\, B^{or} + d_{32}\, X^{or}_{-1} + d_{33}\, \pi^{or} + w_3$$

Two-stage least squares (2SLS)

This model comprises 3 endogenous variables and 3 equations. The endogenous variables are W^{or}, π^{or} and I^{or} and the exogenously given or predetermined variables are p^f, N^{or}, T^d, R^m, Y^{or}, B^{or} and X^{or}_{-1}. Since the number of equations is the same as the number of jointly determined variables, the model is complete. Since 2 of the equations contain more than 1 endogenous variable in each of them, the model if solved by the ordinary least squares method would give biased estimates of the structural coefficients. Also, each equation is overidentified. Therefore the method of 2-stage least squares has been used for estimating these relationships.

The estimates of the structural equations as obtained from the 2-stage least squares are:

Wage equation:

$$W^{or} = \underset{}{-208.63} + \underset{(.319)}{.207}\, p^f + \underset{(.297)}{2.880}\, N^{or}$$

Profit function:

$$\pi^{or} = \underset{}{-39.32} - \underset{(.326)}{.105}\, T^d - \underset{(1.277)}{.152}\, R^m + \underset{(.089)}{.147}\, Y^{or} - \underset{(2.841)}{.730}\, W^{or}$$

Investment equation:

$$I^{or} = \underset{}{-106.37} + \underset{(.494)}{3.287}\, B^{or} + \underset{(1.901)}{2.462}\, X^{or}_{-1} + \underset{(.515)}{.328}\, \pi^{or}$$

The coefficients in all the equations satisfy the tests of logic. The "wages and salaries" bill, as would be expected, has a positive correlation with employment and the prices of food grains through money wage rates. In the profit function, components adding to the costs, and thus inversely affecting the profits, such as direct taxes, value of raw materials consumed, and the wage bill, all have negative coefficients, whereas the variable "sales income", as expected, has a positive coefficient. Again, in the investment equation, the more the borrowings, the more the investment; more profits result in higher investments; and the higher the output level in the previous period, the higher is the expected investment in the current period. Therefore, the positive coefficients of all 3 independent variables in the investment equation satisfy the theoretical formulations.

The elasticity coefficients (table 29) show that:

(1) a 10 percent increase in prices of food grains increases wages and salaries of industrial workers by 1.4 percent, decreases profits by 1 percent, and investment in the private sector by .1 percent;

(2) a 10 percent increase in employment in the manufacturing sector increases the wages and salaries bill by 22 percent, decreases profits by 10 percent, and increases investment by 1.5 percent;

(3) a 10 percent increase in direct taxes decreases profits and investment by 1 percent and .1 percent respectively;

(4) a 1 percent increase in incomes in the industrial sector (private) is accompanied by a nearly 2 percent increase in industrial profits and a .3 percent increase in investment;

(5) a 10 percent increase in borrowings in this sector will produce a 14 percent increase in industrial investments; and

(6) a 10 percent change in industrial production will result in a 6 percent change in industrial investments.

Table 29. **Estimates of elasticity coefficients, model (III) (at the mean values)**

with respect to* \ of*	Wages & salaries W^{o*}	Profits π^{o*}	Investments I^{o*}
Food-grains prices (p^f)*	.14*	− .06	−.01
Manufacturing employment (N^{o*})	2.24	− .96	.14
Direct taxes (T^d)		− .17	−.03
Value of raw materials (R^m)		− .08	−.01
Gross income (Y^{o*})		1.84	.27
Organized sector's borrowings (B^{o*})			.44
Industrial output (X^{o*}_{-1})			.60

*See footnote to table 27.

The indirect effects of prices of food grains and of employment in the manufacturing sector on capital formation in the industrial sector (private) become fairly diluted when they work through the wage bill and the profits. Similarly, direct taxes and the price of raw materials have an extremely weak influence on industrial investment because of their own weak effects on profits. Because of the diluting effects introduced by profits, an alternative model excluding the profit function is investigated in Chapter VI. Industrial incomes, borrowings, and the status of industrial production do play a significant role in influencing capital formation in the privately organized industrial sector.

Direct Relationships in the Public Sector

To accentuate the fluctuations, the trend has been eliminated from net government current (revenue) account, agricultural prices, government capital expenditure, total taxes (direct and indirect), and current expenditure, to enable study of some of the direct relationships. The 2 variables "domestic terms of trade and budgetary deficits" had no significant trend element and have therefore been used as they were observed. The following equations examine these relationships directly and also indirectly through "net revenue account." The data employed are for the period 1951–52 to 1965–66, and are represented without removal of trend. The linear regressions give the following equations:

(7) $A' = -276.09 + \underset{(1.137)}{3.027}\ p^a \qquad R^2 = .35$

(8) $I^g = -42.01 + \underset{(2.400)}{3.236}\ p^a \qquad R^2 = .13$

(9) $I^g = 246.70 + \underset{(.310)}{1.131}\ A' \qquad R^2 = .53$

Equation (7) indicates that agricultural prices and current revenue account (A') have a positive correlation of .6 and a statistically significant (at 5 percent level) regression coefficient. This confirms one of the earlier hypotheses that an increase in agricultural prices would put a squeeze on government through its effect on revenue expenditure. Equation (9) shows a positive correlation coefficient of .7 between government capital expenditure and net revenue account. An increase in the net revenue account (receipts–expenditure) will enable the government to spend increasingly on capital account. The "direct" influence of agricultural prices on government capital expenditure is given by equation (8). The regression coefficient is not significant at the 5 percent level and the correlation coefficient is .4. In terms of orders of magnitude, the slope coefficient is similar to that obtained by substituting (7) into (9). Presumably, the departures from trend for net government account reflect changes in wages and salaries in the government sector, government cur-

rent expenditure, and government receipts on revenue account, either directly or indirectly. On the other hand, total taxes (T) as a function of agricultural prices give the following relationship:

$$T = -658.26 + \underset{(3.039)}{10.757}\ p^a \qquad R^2 = .50 \tag{10}$$

Thus, showing that there is a high positive correlation of .7 and a statistically significant slope coefficient, implying that the fluctuations in net government revenue account are due not only to fluctuations in government expenditure but also to fluctuations in government revenues, so far as they are related to agricultural prices.

Again, a rise in agricultural prices puts a squeeze on government through its effect on current expenditure (CE). This relationship has been studied over the period 1951–52 to 1962–63 and is represented by the following simple relationship:

$$CE = -314.43 + \underset{(2.448)}{7.311}\ p^a \qquad R^2 = .48 \tag{11}$$

which indicates a positive correlation coefficient of .7 and a statistically significant regression coefficient (at 5 percent). Agricultural prices affect the current expenditure which, in turn, influences net revenue account (A^r). The latter after eliminating trend is seen from equation (12) with a correlation coefficient of .7 and a significant slope coefficient.

$$A'' = -137.34 + \underset{(.113)}{.368}\ CE' \qquad R^2 = .52 \tag{12}$$

Thus, the responses to changes in agricultural prices could be a change in various kinds of taxes or a change in government current expenditure. The latter can influence government deficits, resulting in borrowing or credit policy which affects interest rates, as well as investment mix in the public sector including that for infrastructure.

The relationships of A^r, I^g and CE and taxes with domestic terms of trade are given in the regression equations below:

$$A^r = -329.66 + \underset{(2.845)}{3.281}\ p^a/p^m \qquad r = .30 \tag{13}$$

$$I^g = 357.07 - \underset{(5.698)}{1.078}\ p^a/p^m \qquad r = -.05 \tag{14}$$

$$CE = 399.63 - \underset{(8.159)}{.678}\ p^a/p^m \qquad r = -.03 \tag{15}$$

$$T = -654.46 + \underset{(9.215)}{9.645}\ p^a/p^m \qquad r = .29 \tag{16}$$

Equations (13) and (16) show that a positive but not significant correlation exists between the terms of trade and "net revenue account" and "total taxes." Increase in the ratio of prices means that the agricultural

prices increase, or the manufactures' prices decrease, or that the increase in agricultural prices is more than the increase in manufactures' prices. In any of these events, if taxes increase with the increase in terms of trade (16), and if the net revenue account also increases (13), this supports the conclusion tentatively outlined in the previous section that the increase in taxes will be more than the increase in government expenditure as a result of an increase in relative prices. This inference is also in accordance with the analysis shown by equations (7) and (10). The government capital expenditure and the current expenditure do not seem to have been influenced by the changes in the domestic terms of trade, as is observed from extremely low correlation coefficients in equations (14) and (15).

In summary, the government net revenue account, capital and current expenditures, and the total taxes are more strongly influenced by agricultural prices than the ratio of agricultural to manufactures' prices. The relative prices are more influential than agricultural prices alone with respect to budgetary deficits of the central and state governments; however, this influence is not strong enough to qualify for a high probability conclusion.

Chapter VI. Effects of Changes in Agriculture on Industrial Capital Formation—An Econometric Study

An econometric model has been developed to determine (1) whether the occurrences in the agricultural sector, identified by production and price behavior, affect the capital formation in the organized industries in the private sector, and also the investment decisions in the public sector; and (2) what the transformation elasticities are in the private organized and the public industrial sectors.

Private Organized Sector

Economic model

To study the effects of production and prices of food grains on the capital formation in the organized industrial sector, a theoretical framework of analysis has been set up in terms of (1) an investment equation, (2) a wage equation, and (3) a price equation.

The linkage of the effect of agricultural production on investment is established by means of wages. That is, the 3 jointly determined variables of the system are industrial investment, wages of industrial workers, and prices of food grains. As agricultural production falls, the prices of both industrial raw materials and food grains rise. Purchase of food grains — a major item of consumption for the working class — requires

a higher wage. Higher prices of industrial raw materials and higher wages will raise industrial costs, thus reducing profits and investment opportunities. In the other direction, the chain of events will lead to increased profitability which, in turn, will further encourage investments.

Investments are assumed to be a function of lagged income (identified by real production in the industrial sector in the previous time period), lagged prices of variable-dividend industrial securities and profits. The lagged relations stem from the behavior of the manufactures whose decisions are influenced by the status of industrial production in the earlier period. Other investors watch the behavior of the securities' price index before deciding to favor any of the available choices of alternative investment channels

Profit is generally defined as the difference between revenue and costs. Revenue has been proxied by the prices of manufactured products and the level of industrial production, while the chief costs are the wage and the raw-materials bills. The wage bill's influence on investments is seen through the inclusion of the money wage rate of employees in the manufacturing sector and the level of employment.

The price of industrial raw materials is another important explanatory (cost) variable. Inclusion of the variable "physical quantities of industrial raw materials" would give the total raw-materials' bill, but unfortunately, no data are available for the physical inputs of manufacturing industries. It would be safe, however, to assume fixed input-output coefficients.

The investment function could then be visualized as:

$$I^{ov}_t = f\,(X^{ov}_{t-1},\ p^s_{t-1},\ p^m_t,\ p^{rm}_t,\ w^{ov}_t,\ N^{ov}_t)$$

where t = current time period

I^{ov} = investment in the organized industries of the private sector

X^{ov} = index of industrial production representing the income originating from organized industrial sector (1952-53 = 100)

p^s = index of prices of variable dividend industrial securities (1952-53 = 100)

p^{rm} = index of prices of industrial raw materials (1952-53 = 100)

w^{ov}_t = index of money wage rate in the organized industries (factory establishments) (1952-53 = 100)

N^{ov}_t = index of employment in the manufacturing sector

p^m = index of prices of industrial products (manufactures) (1952-53 = 100).

The money wage earnings of factory workers, taken as a jointly determined variable of the system, depend upon the investment in the organized industries proxied by the industrial output per worker, consumer price index of working class through prices of food grains (another jointly dependent variable), and lagged profitability per worker.

Thus we have a wages function as follows:

$$w^{ow}_t = f(\,(X/N)^{ow}_t,\ p^c_t\,(p^f_t),\ (\pi/N)^{ow}_{t-1})$$

where w^{ow} = money earnings per worker

p^c = consumer prices index for the working class

p^f = prices of food grains

X^{ow} = industrial output

π^{ow} = industrial profits

N^{ow} = employment in factory establishments.

When the rate of profitability per worker of the previous period is predetermined and the industrial productivity during the current period is known, it provides enough basis for labor unions to demand suitably adjusted wages. Of course, this entire argument applies only to rising money wages. In other words, downward movement of wages to less than the subsistence level is ruled out.

The wage function is the intermediate link of the interrelationship between investments in organized industries and agricultural (food grains) production. The latter explains prices, the third jointly determined variable of the system. On the demand side, prices of food grains depend on the per capita real income and the money supply. On the supply side, they depend on food grains production and food-grains imports minus exports plus changes in stocks, making adjustment for wastages and seed and feed requirements lagged by 9 months. Therefore we can take the lagged net availability of food grains as the explanatory variable on the supply side. The effect of increase in population is eliminated from both the demand and the supply sides by taking per capita income, money supply, and per capita availability of food grains.

Thus the price of food grains can be expressed as:

$$p^f_t = f((Y/P)_t,\ (X^f/P)_t,\ (m/P)_t)$$

where m_t = money supply

X^f_t = net availability of foodgrains

P = population

Y = index of national income at current prices (1952–53 = 100)

m = money supply.

Statistical model

From the above we build the following model:

Investment function:

$$(17)\ I^{ow}_t = a_{10} + a_{11} X^{ow}_{t-1} + a_{12} p^c_{t-1} + a_{13} p^m_t + a_{14} p^{rm}_t + a_{15} w^{ow}_t + a_{16} N^{ow}_t + U_t$$

Wage function:

(18) $w^{ag}_t = a_{30} + a_{31}\,(\pi/N)^{ag}_{t-1} + a_{32}\,(X/N)^{ag}_t + a_{33}\,p'_t + U_3$

Price equation:

(19) $p'_t = a_{40} + a_{41}\,(Y/P)_t + a_{42}\,(X'/P)_{t-3/4} + a_{43}\,(m/P)_t + U_4$

Since our attention is concentrated on a part of the aggregate economy, some of the variables of the system are assumed to have been given outside the system. These variables, known as predetermined or exogenously given, are: X^{ag}_{t-1}, $(\pi/N)^{ag}_{t-1}$, p'_{t-1}, p'^{m}_t, m_t, N^{ag}_t, $(X/N)^{ag}_t$, p^{m}_t, $(X'/P)_{t-3/4}$, and $(Y/P)_t$. Given the values of these variables, the purpose here is to determine the values of I^{ag}_t, w^{ag}_t, and p'_t and the structural coefficients. These are called the endogenous, or jointly dependent, variables. The "migration rate" of agricultural workers to industry poses definitional and conceptual problems. Added to these were the severe limitations of the availability of time-series data to match with the remaining variables of the model. Therefore, the above formulation excludes this variable. Furthermore, the dropping of this variable will allow a larger number of degrees of freedom, although there may be a specification error as a result of the omission.

Analysis of the statistical model

The structural equations estimated as stage 2 of the 2SLS are:

Investment equation:

$$I^{ag}_t = 2047.37 + \underset{(6.782)}{15.073}\,X^{ag}_{t-1} + \underset{(2.315)}{12.447}\,p'_{t-1} + \underset{(12.108)}{34.526}\,p^{m}_t - \underset{(5.949)}{19.024}\,p'^{m}_t - \underset{(10.311)}{22.312}\,w^{ag}_t - \underset{(12.575)}{10.562}\,N^{ag}_t \qquad R^2 = .97$$

Wage function:

$$w^{ag}_t = 22.07 + \underset{(.023)}{.015}\,(\pi/N)^{ag}_{t-1} + \underset{(.092)}{.694}\,(X/N)^{ag}_t + \underset{(.064)}{.033}\,p'_t \qquad R^2 = .97$$

Price equation:

$$p'_t = 112.02 + \underset{(.291)}{.627}\,(Y/P)_t - \underset{(.322)}{1.198}\,(X'/P)_{t-3/4} + \underset{(.237)}{.327}\,(m/P)_t \qquad R^2 = .93$$

The signs of the estimated structural coefficients in the above 3 equations conform, by and large, to the theoretical considerations. In the investment equation, the level of industrial production and prices of variable-dividend industrial securities, lagged by one period have a positive correlation with the level of current investments; i.e., upward movements in these variables will promote higher investments. The negative coefficient of w^{ag}_t shows that as money wage rates increase, cost components also increase and profits

decrease—a disincentive for higher investments. The negative sign before the coefficient of N^{m}_{t} indicates that the money wage rate and the level of employment in the industrial sector are competitive. The coefficients of w^{m}_{t} and N^{m}_{t} also substantiate another obvious fact that the correlation between the wage bill (w^{m}_{t}, N^{m}_{t}) and the level of investment is positive, which it should be, because the larger the wage bill, the larger the output activity and the larger would be the requirements of corresponding investments. The price of industrial products (p^{m}_{t}) has a positive correlation with the I^{m}_{t}, since these price increases add to the total revenues, while the variable for prices of raw materials (p'^{m}_{t}) has a negative coefficient. The latter would be expected because any raw-materials price increase, as with increase in money wage earnings, would add to production costs, thus decreasing profits, and hence would be a disincentive for investment.

In the wage function, the coefficients of all the variables $(\pi/N)^{m}_{t-1}$, $(X/N)^{m}_{t}$ and p^{f}_{t} are positive. An increase in the industrial profits will inspire the labor class, with the help of organized labor unions, to demand higher wages. The positive correlation of profits, lagged by one period, with money earnings proves this assertion. The coefficient of p^{f}_{t} has been theorized to be positive because an increased level of prices of food grains will necessitate a demand for higher money wages; this hypothesis is borne out by the positive coefficient.

In the price equation, it was hypothesized that the per capita levels of current income and the money supply will be the forces on the demand side while the per capita net availability of food grains will be the chief force on the supply side to determine the level of prices of food grains. The positive correlations of the demand variables and a negative correlation of the supply variable prove these hypotheses.

The resulting standard errors of the structural coefficients and the values of the coefficient of multiple determination R^{2} from the method of 2SLS are usually not precise and appropriate for the conventional tests of hypothesis. Nevertheless, these tests are used as broad guidelines for statistical significance.

The coefficients for variables X^{m}_{t-1}, p^{a}_{t-1}, p^{m}_{t}, p'^{m}_{t} and w^{m}_{t} in the investment equation are all highly significant at the conventional levels (5 percent) of statistical significance. The coefficient of N^{m}_{t} is a little less than its one standard error. This is the only coefficient in the investment equation which does not satisfy the usual tests of significance of twice the standard error or more. Its Beta coefficient, which measures the relative contribution of each independent variable in explaining the total variability of the dependent variable, is the lowest. The relative contribution of the wage bill (w^{m}_{t}, N^{m}_{t}) in explaining the investment behavior is less than that of the variable "prices of industrial raw materials". The Beta coefficient of w^{m}_{t} and N^{m}_{t} will be some sort of a weighted average of their individual coefficients 1.138 and .612, and is expected to lie between these values, whereas the Beta coefficient for p'^{m}_{t} (1.227), would always be higher than

this weighted beta coefficient. This is further substantiated by including in the investment function variables such as the wage and the industrial-raw-materials bills; the respective Beta coefficients were found to be .165 and .148. This supports an earlier finding that raw materials are more important than wages and salaries in the cost structure of Indian industries. The various independent variables in the investment equation, in descending order of their importance in contributing to the total variation of $I^{o'}_t$, are $X^{o'}_{t-1}$, p^m_t, p'^m_t, p^o_{t-1}, $w^{o'}_t$, and $N^{o'}_t$. These variables explain as much as 97 percent of the total explainable variation of the investment in the private organized sector.

In the wage equation, the industrial output per worker $(X/N)^{o'}_t$ is highly significant statistically, the coefficient for prices of food grains is only once its standard error, while the profitability per worker is not significant. For obvious reasons, $(X/N)^{o'}_t$ is the largest contributor in explaining the variability of money earnings per worker. Prices of food grains are stronger than the profits per worker in influencing the movements of money earnings of industrial workers. This equation, comprising the 3 independent variables $(\pi/N)^{o'}_{t-1}$, $(X/N)^{o'}_t$, and p'_t, explains about 97 percent of the total explainable variability of $w^{o'}_t$.

In the price equation, availability of food grains per capita is the most important explanatory variable among the independent variables included therein. Two of the variables included, $(m/P)_t$ and $(X'/P)_{t-3/4}$ are statistically significant at the 5 percent level; the coefficient of (m/P) is nearly 1½ times its standard error. This relationship explains 93 percent of the total explainable variability of the p'_t.

The elasticities of the 3 endogenous variables with respect to the predetermined or exogenous variables are presented in table 30. The indus-

Table 30. **Estimates of elasticity coefficients, private industrial sector (at the mean values)**

	Industrial investments $I^{o'}$	Money wages $w^{o'}$	Food-grains prices p'
Industrial production ($X^{o'}$)	3.64	.007	
Security prices (p^o)	3.12		
Manufactures' prices (p^m)	6.87		
Prices of industrial raw materials (p'^m)	−4.1		
Money wages ($w^{o'}$)	−4.45		
Employment ($N^{o'}$)	−2.16		
Profits ($\pi^{o'}$)	.001	—*	
Food-grains prices (p')	− .13	.03	
Income (y)	.001	—*	.007
Food-grains production (X')	.02	—*	−.013
Money supply (m)	− .001	−.003	.004

(—*: Negligible)

trial production has influence on the industrial investment directly, as well as through money wages. The total effect of X^{pr} on I^{pr} is the sum of the direct and indirect effects, and the elasticity coefficient correspondingly includes this adjustment.

(1) A 1 percent increase in the preceding year's industrial output resulted in 5.64 percent increase in the current industrial investment.

(2) A 1 percent increase in the prices of variable-dividend industrial securities in the previous period increased the industrial investment by 3.12 percent.

(3) A 1 percent increase in the price of manufactures, increased the industrial investment by 6.87 percent.

(4) A 1 percent increase in the prices of industrial raw materials, decreased I^{pr} by 4.1 percent.

(5) A 1 percent increase in money-earning rates of industrial workers caused a 4.45 drop in investment.

(6) A 1 percent increase in the employment in factories decreased the investment by 2.2 percent.

(7) A 10 percent increase in the prices of food grains decreased the industrial investment by 1.3 percent.

(8) A doubling of food-grains availability increased the industrial investment by only 2 percent.

(9) The industrial investment was almost unaffected by the changes in national income, money supply, or previous period profits. The effects of these variables were diluted because of their proposed indirect relationship with the industrial investment.

(10) For a 1 percent increase in prices of food grains, money earnings per worker increased by .03 percent

(11) For a 10 percent increase in industrial output, money earnings per worker increased only by .06 percent.

(12) For a 10 percent increase in national income, prices of food grains increased by about .1 percent

(13) For a 10 percent increase in food-grains availability, prices of food grains decreased only by .13 percent.

(14) For a 10 percent increase in money supply, prices of food grains increased only by .04 percent.

The elasticity coefficients of capital formation in the private industrial sector, with respect to the money earnings per worker and the price of raw materials were of the same order. It was influenced most by the prices of manufactures. A rate of increase in these prices, resulting in higher revenues, was outweighed by the accompanying rate of increase in the volume of investment. In all this analysis, since we are dealing

with absolute and not relative prices, the tacit assumption of "all other prices assumed constant" is implied. Theoretically speaking, the above conclusion leads to the situation that if the government can increase the money supply in such a way as to double all prices, including those of manufactures, because of general inflation, then the investment should increase by about 700 percent, which is obviously absurd. Hence the above assumption.

Public Industrial Sector

Investment in the public sector has a large element of autonomous investment and a relatively small component of induced investment. In the private sector, however, induced investment constitutes the majority of the total investment. "Autonomous" implies that investment is determined outside the system and assumes that the investment and the random disturbance are independent. Despite the autonomous character of the investment here, an attempt is made to formulate an investment function.

Economic model

The causal transitional relationship emanates from changes in the behavior of the agricultural sector, proxied by prices of food grains. Prices of food grains have been related to the capital formation in this sector by a different route from the one adopted for the private sector. The total wage bill for these completed undertakings is the product of the employment level and wage rate. The wage rate of these employees will be a function of prices of food grains, which constitute a large part of the budgets of industrial workers. The wages and salaries and other benefits to employees have also been termed as the "wage income." Wage income and nonwage income — the latter including profits taxes, rents, etc. — would constitute the net value added. The net value added (income generated) by these undertakings will explain the capital stock (capital-output ratio) and the investments in this sector, defined as the difference in capital stocks between the end and the beginning of the period, will depend on the status of capital stock in the previous period and the current availability of foreign exchange. The chain of events can be traced as follows:

$$W^{pu} = f(N^{pu}, p^{f})$$
$$Y^{pu} = W^{pu} + W'^{pu}$$
$$K^{pu} = f(Y^{pu})$$
$$I^{pu} = f(K^{pu}_{-1}, F)$$

where

W^{pu} = wages, salaries and other benefits to employees in the "completed" undertakings of the public sector. *(continued)*

W'^{pu} = nonwage income

N^{pu} = employment

p^f = prices of food grains

Y^{pu} = net value added

K^{pu} = capital stock

F^{pu} = foreign exchange utilized

I^{pu} = investments

Definitions of variables:

Y = net value added = gross income (sales and other income plus changes in inventories) minus expenses on production (purchases of raw materials, and finished and semi-finished parts, repairs and maintenance, power, fuel, etc., and excise duties) minus depreciation.

Y^{pu} = wage income + nonwage income = $W^{pu} + W'^{pu}$

W'^{pu} is derived as a residual from Y after W^{pu} has been accounted for.

K = capital stock = fixed assets less depreciation, capital works in progress, stores, spares, raw materials, tools, and stocks in trade.

$I^{pu} = \Delta K/\Delta t = (K - K_{-1})$

Statistical model

The above is analyzed as follows:

Wage income equation:

(20) $$W^{pu} = d_{10} + d_{11} N^{pu} + d_{12} p^f + U_1$$

Net value added:

(21) $$Y^{pu} = W^{pu} + W'^{pu} \text{ (definitional)}$$

Capital stock relationship:

(22) $$K^{pu} = d_{20} + d_{21} Y^{pu} + U_2$$

Investment equation:

(23) $$I^{pu} = d_{30} + d_{31} K^{pu}_{-1} + d_{32} F^{pu} + U_3$$

In this system of 4 equations, the variables, employment in public-sector undertakings N^{pu}, prices of food grains p^f, nonwage income W'^{pu}, capital stock in the previous period K^{pu}_{-1} and the foreign exchange used during the given period F^{pu} are assumed to be predetermined or exogenously given. Given the observed data on these variables, the effort is to estimate the values of the wage income W^{pu}, net value added Y^{pu}, capital

stock K^{pu} and the investment I^{pu}. The latter are called the endogenous or jointly dependent variables. This system of equations has 4 jointly dependent variables expressed by means of 4 relationships. Each equation, according to the principles of identification, being overidentified will not be subjected to a solution by the method of OLS, but will be solved by the method of 2SLS. The system of 4 equations with 4 endogenous variables is complete

Analysis of the statistical model

The structural equation, derived from the 2SLS using computed values of the jointly dependent variables being used as independent variables (from the reduced forms) are as follows:

Wage income equation:

(24) $$W^{pu} = -85.59 + \underset{(.00005)}{.0002\ N^{pu}} + \underset{(.274)}{.873\ p'} \qquad R^2 = .96$$

Net value-added:

(25) $$Y^{pu} = W^{pu} + W'^{pu}$$

Capital stock equation:

(26) $$K^{pu} = 525.27 + \underset{(.737)}{3.828\ Y^{pu}} \qquad R^2 = .84$$

Investment equation:

(27) $$I^{pu} = 231.06 + \underset{(.213)}{.438\ K^{pu}_{-1}} + \underset{(4.713)}{12.382\ F^{pu}} \qquad R^2 = .85$$

The signs of the estimated coefficients in these 4 equations are in line with theoretical expectations. In the wage–income equation, the prices of food grains (because of their positive relationship with money wages) and the employment have a positive correlation with the wages and salaries bill. Higher income calls for higher levels of capital stock in the "capital stock equation", and both the foreign exchange and the capital stock at the beginning of the period have a positive relationship with current investment demands. In each of the estimated equations, all the structural coefficients are statistically significant at the 5 percent level, and the levels of the coefficients of multiple determination are fairly high. This indicates that the independent variables included herein have explained a major portion of the total variability in the jointly dependent variables. The elasticities are summarized in table 31.

(1) A 1 percent increase in employment in the public undertakings increased the wages and salaries bill by .8 percent, the capital stock by 1.3 percent, and the investment by .4 percent.

(2) For a 1 percent change in the income generated in this sector, there was a change of 6 percent in the capital stock.

(3) A 1 percent increase in the foreign exchange increased the investments by 1.8 percent.

(4) A 1 percent change in the prices of food grains led to a 1.4 percent change in the wages and salaries bill, .3 percent in the capital stock, and .7 percent in the investment.

Table 31. Estimates of elasticity coefficients, public industrial sector (at the mean values)

with respect to* \ of*	Wage bill W^{pu}*	Capital stock K^{pu}	Investment I^{pu}
Employment (N^{pu})*	.76*	1.83	.39
Food-grains prices (p^f)	1.40	.33	.70
Value-added (Y^{pu})		.56	
Foreign exchange (F^{pu})			1.76

*See footnote to table 27.

Chapter VII. Conclusions

The conclusions from this study are summarized below under 3 broad headings: (1) relationships based on structural factors; (2) relationships of terms of trade and agricultural production with economic aggregates and the transfer of capital; and (3) direct and indirect effects of agricultural production on the formation of industrial capital.

Relations based on the industrial structure

In the structure of manufacturing industries in India, the agricultural and agriculturally based industries consisting of foodstuffs, textiles, leather and products thereof formed more than half of the total gross value added. More than half of this sector was accounted for by textiles alone, and cotton textiles formed the bulk of the textiles industries. The traditionally recognized industries such as steel, cement, and paper etc. accounted for a relatively much smaller proportion of the total gross value added.

The correlation between saving in the domestic corporate sector and the urban household sector was real and important because the former would be increasing its saving for the same reason as would the latter. Likewise, the factors that encouraged increased corporate new issues,

which take about 7 percent of the household sector's savings, further encouraged household saving.

The growth in private investment, heavily supported by borrowings, was a function of the growth of depreciation and profits. Rates of growth of saving and investments suggested a disequilibrium position; rate of growth of private investments depended heavily on borrowings. Private investments grew more rapidly, at the rate of 10 percent per annum, than the growth rate of total savings, which was 8 percent. Again disequilibrium was implied here. The natural problems arising from these forces were greatly accentuated during the Third Plan period by the Chinese incursions, which greatly increased defense expenditure, and by the extremely bad agricultural years near the end of the Third Plan. These problems can be corrected only by increased domestic saving and by increased agricultural production. For the public sector, the growth of capital expenditure depended heavily on a rapid growth rate of foreign aid. This phenomenon, of course, may not persist in the future and it may be necessary to increase agricultural production in order to derive higher domestic saving. Furthermore, public policy toward investments in the public sector may need to be reviewed in view of its unfavorable asset-value added ratio of 7.7 as compared to 3.3 of the private sector. This showed that the capacity created in the public sector was underutilized or else the functioning of the process of production was less efficient or lacked proper management. This would have to do with the efficient allocation of scarce resources between private and public sectors for a better growth of capital formation in the overall industrial sector.

Relationships of agricultural production and prices with economic aggregates and transfer of capital

The contribution of agriculture to the net national output declined from 49 percent in 1949–50 to 43 percent in 1964–65. Even though the proportion of the contribution from agriculture in the national income declined, it still accounted for a substantial share. Consequently, the agricultural production and also the food-grains production had a high correlation with the national income. The savings were strongly related to national income and the national income to agricultural production. Agricultural production almost fully explained the behavior of rural household saving and had a statistically significant causal relationship with the domestic saving. The corporate saving's behavior was not influenced by the movements in agricultural production, while that of the saving in the urban households and the total households sector was influenced relatively more by the changes in agricultural production. During 1951–52 to 1964–65, the marginal tax burden for the agricultural sector was overwhelmingly greater than the marginal tax burden for the agricultural sector, showing the disproportionate burden of additional taxation on the nonagricultural sector to finance the development process.

Thus the process of transfer of capital from agriculture to nonagriculture, for which additional taxation is considered an effective means, was not operative.

The agricultural sector paid only about one-sixth of what the nonagricultural sector paid in the form of taxes during 1950–51 to 1964–65, whereas the incidence of government expenditure had been continuously increasing for the agricultural sector as compared with the nonagricultural sector. There was thus a net outflow of public funds on current account to the agricultural sector. Since the net contribution from agriculture has been declining, it would be necessary to levy a relatively higher taxation on the agricultural sector to make it a functionally active contributor to industrial capital formation

The investment per agricultural worker rose faster than productivity per worker. This was due to the fact that, among other things, the government investment on agriculture during this period was not highly productive. On the other hand, the private farm investment and the index of agricultural workers increased more or less apace

Increased volume of investments and improved technology would have to be introduced into the agricultural sector to increase productivity and production; this would help to increase agricultural incomes and thereby the saving in the agricultural sector. An increased production in the agricultural sector would supply cheaper raw materials to industry, which would increase levels of industrial production, levels of industrial incomes, and consequently urban corporate saving. In this process, if the terms of trade became favorable to industry, the household sector would stand to gain by paying less for agricultural consumption items (food grains and nonfood grains) and would thereby be able to save more. Thus the saving of the entire economy can be pushed up by increased agricultural production

The movements in domestic terms of trade (agriculture vs. industry), were such that the marginal increase in agricultural income was greater than that of the industrial sector. Again, the movement in terms of trade towards industrial raw materials, as against manufactures, implied marginally higher costs than revenues for the industrial sector, thus lessening profits and investment potentialities The higher prices of industrial raw materials and food grains in relation to industrial prices benefited agricultural incomes. But, because of low propensity to save, lower incidence of taxation and higher government expenditure, the role of agriculture as a means of contribution for the transfer of income has not been significant.

For a 10 percent change in agricultural production, the farm income changed by 7.5 percent, and for a 10 percent change in agricultural prices, the agricultural income changed only by one-half percent. This indicates that the effect of prices on agricultural income was far weaker than the effect of agricultural production. Prices affect income only in proportion

to the marketable surplus, which is a small portion of the total output. Therefore, in an economy where a high proportion of production is consumed in farm homes, prices have little relevance to the generation of real income. In a sense, from the real income point of view of the farm family, what is produced and consumed at home never experiences a change in price. The utility can be assumed to stay the same. In addition, when production falls, prices rise, and vice versa.

For a unit percent change in agricultural production the demand for industrial products changed by one-half percent. This analysis suggested that agricultural price increases had significant effects on the capital formation of the industrial sector from the cost structure viewpoint. An increase in the price of agricultural commodities, including industrial raw materials — which raised the cost of production and resulted in higher prices of industrial products — was a deterrent to increased demand for industrial products.

The usual emphasis on increasing food grains production alone has been belied by our analysis. Food grains form a relatively small part of the household budgets of urban areas. In fact the consumption of nonfood grains such as milk and milk products, vegetables, fruits, eggs, meat, etc., was quite significant. Therefore it becomes obvious that increased production of food grains alone should not be overemphasized at the cost of deterring nonfood-grains availability, the latter being so vital to the current expenditure patterns.

Direct and indirect effects of food-grains production on formation of industrial capital

The development of the industrial sector depends on agricultural production: agricultural production affects the national income and is a source of supply of industrial raw materials. A decline in agricultural production raises agricultural prices including those of industrial raw materials. In the industrial sector, the cost of production is forced up, which reduces profits and is thereby a disincentive for increasing investments. Raising the prices of industrial products, particularly consumer goods, decreases demand, especially if rising food prices consequent to a fall in food production are squeezing the budgets of industrial workers. Under these conditions, if the wages of industrial workers were raised, the increased wage bill, along with already high prices of industrial raw materials, would definitely be instrumental in reducing profits and capital formation, and thereby retard the process of economic development. Hence, increased agricultural production was crucial to the industrial capital formation and to the process of economic development.

The elasticity of capital formation in the private industrial sector with respect to money earnings per worker and the prices of industrial raw materials were of the same order, elasticity coefficients being 4.5 and 4.1

respectively. It was influenced most by the prices of manufactures. A one percent increase in the manufactures' prices was a great incentive to increase investments by as much as 7 percent. An increase in these prices, resulting in higher revenues were, therefore, outweighed by the accompanying increases in the volume of investment. Since we dealt with absolute and not relative prices in this analysis the assumption of all "other prices assumed constant" was implied.

The indirect effects of prices of food grains and the employment in the manufacturing sector on the private sector industrial capital formation was diluted when both these variables worked through "wage bill" and "profits." A 10 percent increase in the prices of food grains increased the wage bill by 1.4 percent and decreased the profits by .6 percent and the capital formation by .1 percent. Industrial incomes, borrowings, and the status of industrial production did play a significan role in influencing the capital formation in the private industrial sector.

As the revenue account was squeezed (assuming expenditure as given), the revenue was increased by raising taxes. This increased revenue along with the "borrowings" formed the supply of investible funds by the government while total government spendings reflected the demands on government resources With increased supply of resources, the capital expenditure tended to increase. Again, with an increase of 1 percent in total expenditure, capital expenditure, which was a part of total spending, also increased by 95 percent Therefore, the capital expenditure in this case was affected by both supply and demand of public resources

The total wage bill of the government sector increased more because of the expansion in the employment magnitudes than the increases in money wage rates. This was shown by the elasticity coefficients, namely, that the wage bill increased by .7 percent and .5 percent as a result of a 1 percent increase in employment volume and food-grains prices respectively.

With the increase in food-grains prices, the salaried class, of which the government sector was a significant contributor, demanded higher wages: this raised the cost of government administration which, in turn, put a squeeze on government revenue account Increased government spending and the consequent strains on current account called for increased borrowings which again affected positively the total spending as well as the public capital expenditure The elasticity coefficients showed that for a 1 percent increase in food-grains prices, the increase in capital expenditure was 1.5 percent.

The prices of food grains which are related to the index of consumer prices and then to money earnings did have a significant influence on capital formation in the public sector. The role of food-grains prices in the private sector, on the other hand, was not as important. The relationship between money earnings and prices of food grains involves complex lags and, to a certain extent, was dependent upon the level of dearness

allowance. Rise in cost of living, which was mostly due to a rise in the food prices, was adjusted with a certain time lag; this lag being different for public and private industrial sectors' employees. The identity of dearness allowance in the money earnings being not as clear for the workers in the private industrial sector as for the public sector employees, the current effect of food prices was more pronounced on the latter. However, the nature of lags will have to be worked out before the effect of food prices in the capital formation of the respective sectors can be completely evaluated.

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Much of the research on India performed in the Department of Agricultural Economics is summarized in a policy context in: *Developing Rural India: Plan and Practice,* by John W. Mellor, Thomas F. Weaver, Uma J. Lele and Sheldon R. Simon. Cornell University Press, Ithaca, New York, 1968.